THE UPPER CERVICAL
MONOGRAPH

Vol. 7, No. 1 *Published by* **THE NATIONAL UPPER CERVICAL CHIROPRACTIC RESEARCH ASSOCIATION** April 2008

TABLE OF CONTENTS

Editorial
The Most Significant Paper in Upper Cervical Chiropractic
By J. Palmer, Editor

Dr. Marshall Dickholtz Sr. Award for Scientific Research

A Brief History of the Modus Operandi of Measuring and Correcting the Atlas Subluxation Complex Syndrome and the Role of Posture in the National Upper Cervical Chiropractic Association (NUCCA) Standard of Care
J. Palmer and K. Creswell

Upper Quarter Finite Element Modeling Proposal for NUCCRA
By Jim Palmer

Clinical Effectiveness (Precision and Reliability) Update on NUCCA Adjusting: Atlas Laterality and Rotation
By Professor J. Palmer, Editor, & J. Cord Palmer, Graduate student NC State

Dental Abstract

Questions from the Students at Palmer College and Responses
by UCRF Director of Research, Professor J. Palmer

Three case studies of TMD
By J.F.Palmer, K. Creswell, M. Dickholtz Sr, and J.Cord Palmer

Practice Based Research - A Solution for Evidence
By H. Charles Woodfield, III, RPh, DC Associate Professor Research, Parker College of Chiropractic

The Basic Comparison Notes
By Professor J. Palmer

Practice abstract

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Comments from the Editor

The Upper Cervical Monograph is undergoing a refocusing of direction and purpose that should be evident with this Monograph. Beginning in 2008 the Monograph will serve as an important source of information that will lead to clarification of NUCCA practice, refinement of protocol, integration with the areas of health care practice that overlap and/ or intersect the traditional upper cervical approach, and possible redefinition of fundamental assumptions . There will be invited papers, research summaries, abstracts, reprinted papers, complete and original research papers, discussion of research efforts and directions, book reviews, case studies, and significant results from the field.

All other material deemed appropriate will be shared on a future website; this material can include debate, useful practice survey instruments, technical suggestions on biomechanics and adjusting, neurology, symptomatology, etc. A listing of items submitted to the Monograph editor that are placed on the future website will be listed in each Monograph.

Those wishing to submit research for publication must have a title and an abstract, a bibliography, and the main body should not exceed 3000 words. All non-invited papers will be reviewed by at least one reviewer and an editor. Both double-spaced paper copies and an electronic version must be sent for submission. All type should be 11 point times roman “with single spacing” (auto) with 1/2 inch left and right margins, header size 18 points. Every table, graph, figure or picture should be placed on a separate page.

Posture and problems of the “upper quarter condition” will be the areas of general focus and The Upper Cervical Monograph will be adept at taking advantage of the “shift in the prevailing winds”.

Upper Cervical Research Foundation Mission Statement

The Upper Cervical Research Foundation is devoted to developing and facilitating comprehensive research to investigate the relationship between the biomechanical and neurological balance of the upper cervical spine and its profound effect on human health and well being.

Editorial
The Most Significant Paper in Upper Cervical Chiropractic

By J. Palmer, Editor

Probably the most significant paper to be published in the last 50 years connecting the medical profession and chiropractic was issued in printed form in the May 2007 issue of the Journal of Human Hypertension. The advance on- line publication (electronic form) occurred on March 2, 2007, under the title: Atlas vertebra realignment and achievement of arterial pressure goal in hypertensive patients: a pilot study. The study was first presented at a medical conference in New York on May 20, 2006, by the lead author. The widely read "WebMD", in a March 17, 2007 release, provides comments by the two major participants in the research.

The lead author of the paper, George Bakris, MD, is director of the hypertension center at the University of Chicago's Pritzker School of Medicine and is author of more than 250 papers. Dr. Bakris specializes in the diagnosis and reduction of high blood pressure. WebMD reports that "When the statistician brought me the data, I actually didn't believe it. It was way too good to be true," Bakris says. "The statistician said, 'I don't even believe it.' But we checked for everything, and there it was. This procedure (Atlas adjustment by the NUCCA technique) has the effect of not one, but two blood-pressure medications given in combination. And it seems to be adverse-event free. We saw no side effects and no problems." The study showed an average of 14mm Hg greater drop in systolic pressure (the top number in a blood pressure count) and an average 8mm Hg greater drop in diastolic blood pressure (the bottom blood pressure number) in level-one hypertension patients who were in the treatment group than in the control group.

In the discussion section of the paper the nine co-authors state that "techniques are now available to screen for atlas misalignment. This type of screening should be the responsibility of the primary care physician and should be performed on patients who have a history of head and neck trauma even if it is deemed insignificant. Misalignment of the Atlas can be determined by assessment of the alignment of the pelvic crests and should be considered in those who have a history of hypertension and require multiple medications for treatment as well as those with a history of neck injuries, independent of the presence of pain. At a time when hypertension is a prevalent disease (heart disease annual cost: $259 billion) and its control becomes increasingly more difficult due to a variety of factors, linking the correction of C-1 (Atlas) misalignment to the subsequent lowering of BP may represent an important advancement in the screening of such patients." (Hypertension is the most prevalent cardiovascular disease in the world. Despite the availability of a myriad of antihypertensive agents, adequate blood pressure control is achieved by only 27% of US patients.)

The second author of the paper, 84-year-old Marshall Dickholtz Sr., DC, is the Chicago-based adjusting upper cervical chiropractor of record. Dr. Dickholtz who was president of the National Upper Cervical Chiropractic Research Association (NUCCRA) at the time of the study used the NUCCA clinical protocol and technique in this study. The NUCCA technique was developed by the late Ralph R. Gregory, DC, of Monroe, Michigan. NUCCRA is a non-profit private foundation headquarted in Monroe and was incorporated in 1971 by Ralph R. Gregory (NUCCRA has been doing business as UCRF, the Upper Cervical Research Foundation, since June 2007.) Dr. Dickholtz was a long time student and colleague of Dr. Gregory and is a member of the founding NUCCA Board of Directors. Dr. Dickholtz Sr. is also NUCCA Board Certified and is a recipient of the prestigious R.R.Gregory Award and the D.D.Palmer Scientific Award Medal.

WebMD reports that "We are not doctors. We are spinal engineers," Dickholtz says. "We use mathematics, geometry, and physics to learn how to slide everything back into place." The purpose of the adjustment is to mechanically return the head and neck to its normal position. By returning the head and neck to its balanced position neurological integrity is restored and body posture is returned to normal. WebMD credits Dickholtz with stating that high blood pressure is far from the only thing an Atlas misalignment causes. This is because the NUCCA procedure influences one of the highest control centers over body balance, the brain stem and the central nervous system. The Atlas is a small donut-like bone located at the top of the spine and the base of the skull that surrounds the brain stem. When the spine is subjected to stress it can become misaligned. When the spine becomes misaligned sufficiently it stresses the nerves, compromises their normal impulses, and changes function throughout the body. It is the function of the NUCCA chiropractor to correct the misalignment and thereby restore the biomechanical and neurological integrity.

The NUCCA analysis procedure is based on postural measurements with an instrument called the Anatometer (developed by Peter Benesh and Ralph Gregory of Monroe and Dan Seemann of the University of Toledo, made in Monroe by Benexel Corporation, and tested at the University of Toledo in 2006) and on precision X-rays which are used not only to determine if there are any contraindications to care but also to determine a specific adjustic vector for each case, all of which are unique to the patient. The NUCCA procedure has been described as a highly advanced and extremely precise and gentle technique unlike any other kind of care. NUCCA addresses mechanical spinal injuries (trauma) primarily in the neck and head region. These injuries cause neurological, postural, and spinal imbalances. Far ranging effects have been seen throughout the human frame; for example, success has been seen with lumbar pain.

Most patients in a NUCCA practitioner's office have a history of trauma; for example, car accidents, sports injuries, falls, or it may be something as minor as a bump on the head. Most of these injuries are 5-10 years old before they cause symptoms. A potential patient is most likely to feel that their body is out of balance; for example, the head is tilted, one shoulder is low, or that one hip is higher than the other.

NUCCA doctors do not claim that what they do should substitute for standard medical practice nor do they necessarily take people on the basis of symptoms or pain. Chiropractors should take into consideration not only potential litigation problems but also who the courts probably will define as the primary care physician. When people seek chiropractic care for postural problems related to the Atlas Subluxation Complex which is concurrent with their special medical problem, then that is where the licensed NUCCA upper cervical specialist brings in his set of knowledge, experience, and judgment. It is clear that the upper cervical chiropractor needs to provide an excellent patient education program so that reasonable people can make reasonable decisions. Addressing abnormal anatomical posture is the forte of a NUCCA chiropractor. (See article by J. Palmer and K.Creswell in this issue; it can also be found at www.ucrf.org .) Dr. Bakris is presently planning a more comprehensive trial that will involve more NUCCA doctors and will be designed to identify the most likely high blood pressure candidates who can benefit from Atlas alignment. As of this writing a proposal on leg-check is in the process of being submitted to NIH by Dr. Bell, Bakris, Woodfield, and others with technique support being provided by NUCCA doctors.

This study is a vindication of R. R.Gregory's work, creativity, and vision and is a validation of the pursuit of excellence in chiropractic care by this Doctor from Chicago. It is understandable that this Doctor from Chicago who is all heart would have a profound effect on those with problems associated with the heart. The research results are evidence that attention to detail is all important when coupled with accuracy and precision in executing all phases of the NUCCA paradigm. Only attention to detail can illuminate the solutions to improving the human condition. As Gregory always said, "Practice does not make perfect, only perfect practice makes perfect". And above all the research shows that NUCCA unequivocally works when practiced to perfection. This Doctor from Chicago is no longer just a NUCCA doctor but has taken his place with equal status alongside Grostic and Gregory because of the fundamental importance and quality of this monumental research on hypertension. Evidence that medication may be eliminated or reduced for Level I hypertension patients who have a contractured leg is truly extraordinary. One NUCCA board certified doctor said that this research finding "will bring 20,000,000 more people to chiropractic" and hopefully most to orthogonally-based upper- cervical chiropractic. This research is worth a second D.D. Palmer Scientific Award (NUCCRA has established the Dr. Marshall Dickholtz Sr Award for Scientific Research [April 2007] with Dr. Dickholtz being the first recipient.). This study is Dr. Dickholtz's magnum opus and is the magnum opus of upper cervical chiropractic. Besides showing that NUCCA works to perfection when practiced at its highest level, what are the other implications and observations of this high blood pressure study?

Research results show correction of atlas mal-alignment factors as measured on X-ray at an 80 % or better value (NUCCA board certification standards) reduces and maintains a lower blood pressure. (Several months ago this editor was adjusted in the Monroe office and immediately after adjustment had a blood pressure measurement of 134/80. Thirty minutes later this editor stopped at an out-patient medical clinic and clinic personnel recorded a 104/72. A lowering of blood pressure after adjustment is what this editor personally has always found to be the case on those occasions when blood pressure had been checked after a correction.)

The blood pressure research shows that the two recorded X-ray relative positional values, Atlas laterality and Atlas rotation, of the control group are constant over time. That is, there is a "fixation" of position of the Atlas on X-rays when the patient positioning for X-rays is constant over time.

Correction of posture as measured by supine leg check and Anatometer is correlated with correction of mal-alignment of the Atlas. Note that the authors screened for Atlas misalignment by supine leg check and used the result for defining the initial study population; the authors suggested that the primary care physician should have the responsibility to screen for atlas misalignment which can be by assessment of the alignment of the pelvic crests. Head units for posture measurement and whole body posture screening devices without hip calipers do not satisfy the recommendation by the nine co-authors of the study. In fact, only the Anatometer has been shown to provide the statistically significant correlations. This study shows that the control group's (sham adjusted group) frontal plane pelvic distortion, transverse plane pelvic distortion, and lateral displacement of C-7 are constant over time as measured by the Anatometer. The study also showed that the post-adjustment treatment group's corrected frontal plane pelvic distortion, transverse plane pelvic distortion, and lateral displacement of C-7 were constant over an 8-week period for the subjects maintaining correction.

Patient positioning for X-rays and the taking of X-rays was done by Dr. Brown and Dr. Chung. This study supports the proposition that patient positioning for X-rays is reproducible over time. An analysis of the statistics of individuals in this study (not explicitly given in the paper but done nevertheless) on a case by case basis supports the statement that a subject with less than 0.75 degrees of Atlas laterality (side slip of the Atlas in the frontal/coronal plane around the condyles of occiput) will neither have pelvic distortion nor lateral displacement of C-7 of any significance. (See article by Palmer and Palmer in this issue)

As both the editor of The Upper Cervical Monograph and the NUCCRA (UCRF) director of research, what is perceived as the implications of this study? NUCCA Board certification with its requirement of 80% or better proportional reduction in Atlas misalignment factors is a reasonable requirement for upper cervical chiropractic. It is believed to be a necessary requirement to have a "too good to be true" result. Having been involved for more than a score of years with NUCCA leads the editor to believe that an additional 10 years since full certification is also a reasonable requirement for consistent excellent results. NUCCA certification standards or the equivalent should be the goal of every upper cervical doctor, regardless of the technique.

This evolution of the circumstances culminating in this study suggests that the orthogonally-based upper cervical groups should not let the chiropractic colleges define their research agenda and should be engaged in research with chiropractic research departments only when and if they are equal partners and when most if not all of the money is coming from or through the college's

grants. A blood pressure study was not on the agenda of any chiropractic college. A study was published in J Hypertension 2002 Oct; 20(10) 2063-8 by C. Goetz (Choate) [Executive Director of Palmer Center for Chiropractic Research] and others and titled: Treatment of Hypertension with Alternative Therapies: a randomized clinical trial; that study had negative results using diversified technique.

Wernsing-Grostic-Gregory-NUCCA upper cervical research was not on any of the agendas of chiropractic colleges (It should be noted that in 2005 Life Chiropractic College West did suggest research with NUCCRA); back pain and headaches have dominated chiropractic research efforts. Upper cervical research runs counter to the controlling boards, administrators, and research departments' agendas and the mainstream chiropractic paradigm: palpation, pain, segmental therapy, and range of motion. Research has consistently shown that palpation lacks specificity for the upper cervical spine; in part this is because the position of the Atlas makes palpation difficult at best. Mainstream chiropractic needs fixation of vertebrae and the existence of pain. The Atlas is the most moveable spinal vertebra by design and therefore is the most difficult to find fixated by palpation. And this study had no one with pain! Use of a Neck Disability Index would not have been appropriate. In essence the chiropractic research departments are too tied into the Spinal Manipulation Therapy paradigm. [A former president of NUCCA said (reference in Vector) that he chose NUCCA because he wanted to know the side of the Atlas misalignment.]

This study is an unsolvable dilemma for mainstream chiropractic. It appears that mainstream chiropractic is embracing the results as being "chiropractic" and not orthogonally-based upper- cervical chiropractic. It remains to be seen how non-orthogonal upper cervical specific chiropractic techniques embrace the results; they certainly should want to use the pre- and post X-ray argument. It should be evident that chiropractic in today's world needs to be defined not by what is done by mainstream chiropractic, but what should be done, for example NUCCA, by mainstream chiropractic.

As of the publication of this issue of the Upper Cervical Monograph only Life Chiropractic College West (Hayward, California) has a NUCCA course in its required curriculum (the NUCCA portion has been reduced from 5 to 2 units); an elective course on NUCCA is also available through the college. Life University College of Chiropractic (Marietta, Georgia) focused on orthogonally-based upper cervical specific in the 1980s and early 1990s because its founder, Dr. Sid Williams, had the necessary vision and employed a high quality research staff which was interested in orthogonally-based upper cervical techniques. Sherman College of Straight Chiropractic (Spartanburg, South Carolina) realizes the importance of upper cervical by its post -graduate Diplomate program in upper cervical. AUCCO, the Academy of Upper Cervical Chiropractic Organizations, also has its roots in the three primary orthogonally-based upper cervical groups. NUCCA doctors are encouraged to obtain the Diplomate degree.

NUCCA appears to be a more necessary key than ever to the upper cervical evolution, revolution and renaissance! The NUCCRA board is strategically placing NUCCA doctors and NUCCRA/ UCRF research to be an integral part of the future of chiropractic and chiropractic research. The vision of UCRF is to be seen as a necessary player in research involving the Atlas Subluxation Complex. The Upper Cervical Research Foundation is devoted to developing and facilitating comprehensive research to investigate the relationship between the biomechanical and neurological balance of the upper cervical spine and its profound effect on human health and well being. The NUCCRA website has been totally redone and can be accessed at www.ucrf.org .

For any number of reasons this editor is of the opinion that high velocity spinal manipulative therapy in the upper cervical region should no longer be taught in the chiropractic colleges or tolerated by state licensing boards. That there are such profound effects, for example, involving hypertension, posture, and atlas mis-alignment of .17 mm (0.75 degrees atlas laterality) or more strongly suggests that there is more than sufficient fundamental evidence that X-rays of the type taken and the reasons that they are taken are altogether appropriate and necessary. Those small differences in head support placement and in location of a "gentle" force make all the difference between a sham procedure and an adjustic correction argues for the necessity of a calculated vector and an understanding of the biomechanics. According to the nine co- authors of the study, "the sham intervention was…indistinguishable from the authentic alignment, possible only because of the delicacy of the procedure". A slight change of position of the patient's head on the head support and a missing of the lateral-mass contact point did not permit change in any study variable.

In summary, the non-invasiveness of the sham procedure and the small differences in head placement and manual articulation supports the high degree of specificity in the NUCCA adjustic procedure and supports the need to have a both a correct vector and proper head support for a minimum magnitude of adjustic force. These realities support the entire analysis procedure, including the necessity of pre- and post X-rays. It will be interesting to see how chiropractic colleges show that what they teach in the required curriculum and do in their research departments is as effective and non-invasive as NUCCA appears to be for hypertension.

Palmer College rushed to submit a NIH proposal on August 13, 2007, (Complimentary and Alternative Medicine) to expand the blood pressure study of Bakris, Bell, and Dickholtz. It is believed that they will also look at TMJ and several other areas related to upper cervical. Participating NUCCA doctors are understood to be Drs. Yardley, Berti, and other NUCCA doctors from the Northwest. The proposal requires comparison of NUCCA with Palmer College's Toggle Recoil.

Certainly the chiropractic colleges should be able to admit that NUCCA/ orthogonally-based upper- cervical specific is the leader in upper cervical adjustment affecting hypertension and is therefore, at present, the preferred (only proven) method. Certainly mainstream chiropractic should be able to realize that their paradigm may be inappropriate- at the very least- when dealing with the upper cervical region; possibly this research may be the beginning of mainstream's realization that orthogonally-based upper cervical specific is a specialty in chiropractic worthy of support and respect. NUCCRA (UCRF) will focus on both fundamental biomechanical research and studies which have the greatest impact on other health care providers through involvement in the scientific community

which has no stake in the status quo of chiropractic, upper cervical specific, NUCCA, or any other health regime.

This editor's recommendation is that fund-granting agencies need to seriously consider focusing on orthogonally-based, upper-cervical specific in general and in NUCCA in particular. This is said about NUCCA in particular because the NUCCA certification process has provided a ready body of upper cervical technique practitioners who achieve consistent, quality results as measured by x-rays, posture or even symptoms. Dr. Cecil Laney in a recent Monograph stated that he was "averaging over 70% corrections with (his) hand- held adjuster" by the time of his retirement. This result is very promising! Proportionate reductions even at the 50-55% level are significant no matter how they are done; this level of correction is assumed (because of no post X-rays by spinal manipulation therapy) to be way ahead of any mainstream spinal manipulation and is assuredly believed to be much less deleterious. Many non-board certified NUCCA doctors are probably practicing at this level (50-55%) and are making a valuable contribution to chiropractic and more importantly to the well-being of their patients. New (less than 3-5 years) upper cervical doctors in orthogonally-based upper cervical practice may be only averaging 25-35 % reduction. But proportionate reductions or corrections to or towards normal of this magnitude are valuable too. Keep in mind that one needs to be on the correct side of Atlas laterality to be able to correct to or towards normal with the least invasiveness to the patient; that is half the problem. The goal is to restore neurological integrity. A 50% correction on a 1.25 - degree Atlas laterality restores neurological integrity. Since approximately one-third to one-half of new patients have a 1.25 degree or less laterality such results are significant. NUCCA doctors have found that the more complete the correction and proportionate the reduction of misalignment factors, the better the resolving of symptoms and the longer lasting the correction (e.g., the blood pressure study).

Data on levels of Atlas misalignment reductions given in an earlier issue of the Monograph that had compared Grostic data to data by Gregory and to a much lesser extent by Denton and Palmer which suggests that the NUCCA technique was more advanced than Grostic has created nothing but animosity with some key chiropractors in other orthogonally-based upper cervical specific groups. (See update by Palmer and Palmer in this issue.) Now Dickholtz's data is also in line with more "recent" NUCCA data. This is not the reason to shoot the messenger or to ignore the data. Maybe it just might be that NUCCA provides a measurable improvement because of the many developments by Gregory and enhancements (e.g., the laser light system) by people such as Dickholtz over the last half century.

Who knows what happens if post X-rays are not taken. Certainly a cornerstone of education is to learn from mistakes that are made; there is little biomechanical proof without post X-rays of the mistakes that were made. So how does one learn (improve)? An upper cervical chiropractic doctor cannot get to be excellent in upper cervical practice if the total effort is not upper cervical. NUCCA upper cervical chiropractic is too difficult to master without 100% dedication and 100% practice. It is impossible to learn without knowing and understanding the mistakes that are made in reduction of misalignment factors. You have to have an excellent system to have long-term excellent results.

What was not said in the published study? After several months the control (sham/placebo) group was then adjusted resulting in "identical results" (X-ray and posture) to the original NUCCA treatment (experimental) group. When asked why this wasn't part of the study, Dr. Dickholtz said they (medical personnel) were "so happy with the results (to that point) that they did not need it."

To the would be critics of this study, keep in mind that the blood pressures were done by the highest standards using competent medical personnel ; the medical assessments involving potential side effects were also done by top medical personnel. The taking of the X-rays and placement of the subjects for X-rays was done by Dr. Brown and Dr. Chung. All subjects had a short leg (contractured leg) and from this group the control and treatment groups were randomly selected. The force transducers on the bi-lateral foot plates which provide the variable of percent weight differential were used in this study and showed a bigger change in the treatment group than in the control group; that measurement is really automatic and cannot be easily influenced . Dr. Dickholtz Sr. analyzed the X-rays, adjusted patients, and measured posture with the Anatometer. All subjects were blind-folded for all Anatometer measurements so that (1) subjects would not try to correct for posture upon seeing the laser lights and (2) because a less biased response to body-positioning could be achieved. The Dickholtz laser-light system magnifies (acts as an optical lever) and enhances the traditional set of Anatometer measurements by providing a lateral posture measurement; all laser-light patterns for each subject were recorded with a digital camera. All subjects of the control group were treated after 10 weeks of being off medication; the results were the same as the initial treatment group.

If pre X-rays were analyzed incorrectly then the wrong vector would have been used and people could have had their blood pressure reduced by a " random vector"; certainly this effect of reducing blood pressure by a random vector would have been seen by mainstream chiropractic on a wide scale years ago. [There are approximately 200 million chiropractic visits per year involving cervical spinal manipulation therapy (JMPT 2005; 28:520-525 by M. Haneline). This is about two-thirds of all chiropractic visits.] The experience of NUCCA doctors is that random vectors do not proportionately reduce the misalignment factors; in fact one basic pattern could easily result in another basic pattern (type) that is actually potentially more deleterious to the patient.

Dr. Marshall Dickholtz Sr. Award for Scientific Research

The Dr. Marshall Dickholtz Sr. Award for Scientific Research is established in recognition of Dr. Marshall Dickholtz Sr. who is bringing upper cervical chiropractic to the attention of doctors of chiropractic and doctors of medicine through his research on hypertension. His quest in the continual improvement of the art of upper cervical chiropractic is transitioning all of the chiropractic profession into a renaissance in the science of chiropractic. His research on hypertension is the magnum opus for upper cervical chiropractic and leads all of chiropractic into the 21st century. It is understandable that this Doctor from Chicago who is all heart would have a profound effect on those with problems associated with the heart. Recipient of the D.D. Palmer Scientific Award Medal and the R. R. Gregory Achievement Award more than a decade before his astounding research in hypertension illustrates that this indefatigable researcher just keeps getting better. His current research is affecting research in temporal mandibular disorders and cervicogenic headaches and his earlier success with research on chronic fatigue and the lowering of cortisol levels to normal will impact the understanding of aging, depression, and Alzheimer disease. His research has provided evidence that restoring biomechanical and neurological integrity to the upper cervical spine affects the entire spine. Dr. Dickholtz is this century's most prominent chiropractic figure in establishing the science of chiropractic. *(The efforts of Dr. Dickholtz have been financed by his own means; it is altogether the more remarkable that he so graciously has preserved his love of his colleagues in NUCCA and his belief in the miracle of the restoration of the health of so many. This Doctor from Chicago instills love and enthusiasm in every interaction and has been sharing and giving everything he loves with those who have been willing to accept. As the first recipient of this award the NUCCRA Board and all NUCCA doctors are honored by his acceptance. Editor)*

(Award was presented to Dr. Marshall Dickholtz, Sr. at the NUCCA spring convention 2007.)

The Pace of Dr. Marshall Dickholtz Sr

Since the publication of the blood pressure study in the May 2007 issue of the Journal of Human Hypertension, Dr. Dickholtz has become Chicago's most visible chiropractor. His first television appearance was in a 12-minute segment with Dr. Bakris and Dr. Bell on channel 11. He was the doctor- of- focus in a call-in; ask-the –doctor, half-hour health show on the Chicago Community Channel. Ivanhoe Productions made a 1.5 minute segment on Dr. Dickholtz for inclusion in their 10 segment production highlighting "Medical Breakthroughs"; this segment has already run on over 140 television stations in the United States. On January 22 (2008), "A Conversation with Dr. Marshall Dickholtz Sr" was made; this conversation is being edited for different audiences. Chicago's channel 5 recently aired a two-minute segment of their own making and channel 7 made a 2.5 minute production on March 10th. Dr. Dickholtz has been named Chiropractor of the Year 2007 by the Illinois Prairie State Chiropractic Association. Dr. Dickholtz presented at Palmer College on March 18 (2008) and is scheduled to present at the Mayo Clinic Chicago meeting in December of this year. Magnetoencephalography (MEG) and MRI Phase Contrast are scanning procedures being used to assess some of Dr. Dickholt's patients. Dr. Dickholtz is co-author on a paper on non-migraine headache being submitted for publication. *(Editor: J. Palmer)*

A Brief History of the Modus Operandi of Measuring and Correcting the Atlas Subluxation Complex Syndrome and the Role of Posture in the National Upper Cervical Chiropractic Association (NUCCA) Standard of Care

By Jim Palmer, Professor of Physics @University of Toledo and Kevin Creswell, NUCCA Doctor of Chiropractic @ Edmonton, Canada

(This paper was presented at the 13th International ICCMO Congress, Kona, Hawaii, Nov. 4-6, 2005 and was a supplement to a Power Point Presentation)

Abstract: The case is presented for the historical importance of the C-0, C-1, C-2 joint complex in the development of early chiropractic and the difficulties that have been overcome by Grostic-Gregory and more recently by Gregory (NUCCA) in developing a rigorous, repeatable, consistent analysis system used both before and after intervention with the result being the elimination of the observable and measurable signs of the Atlas Subluxation Complex. Measurement of the success of intervention is evidenced by postural changes, by changes between pre and post X-ray measurements, and by an improvement in medically diagnosed health problems and associated signs and symptoms.

Key words: posture, upper cervical, Atlas Subluxation Complex Syndrome, Atlas Subluxation Complex (ASC), contractured leg or LLI; C-1 joint, Anatometer, basic types, biomechanics, atlas laterality, atlas rotation, and normal cervical biomechanical relationship.

Posture and Its Measurement: A Brief History

Posture is the position or carriage of the body and limbs as a whole and is a manifestation of the degree of biomechanical balance and positional symmetry in an individual and is an interrelationship between muscle and skeletal tissue of the body. R. Hruska describes posture thusly:

Posture is a reflection of the 'position' of many systems that are regulated, determined and created through limited functional patterns. These patterns reflect our ability and inability to breathe, rotate, and rest, symmetrically with the left and right hemispheres of our axial structure. Function (movement) is … limited because soft tissue and osseous restrictions prevent one from using muscles and joints beyond their normal (design) range. Adaptation and compensation for these limitations require neuromotor encoding and hyperactivity of muscle…(with) compensatory activity and hyperactivity usually (becoming) dysnchronous in the accessory muscles of respiration and at the appendicular flexors and axial extensors, thus limiting functional rotation at the trunk and through the lumbo-pelvic-femoral and cranial-mandibular-cervical complex.[1]

Investigations of upright or load-bearing posture have ranged from the highly subjective visual grading to the more objective methods utilizing photographs, bilateral and four-quadrant weight scales, Anatometer I, II, and II plus, X-rays, electromyography, and moiré topography. Defining "good" posture and determining how "good" posture should be measured has seen little agreement among authorities. This point was made clear in a review by W.W. Massey in which he stated:

In the literature related to standards of "good" posture, there were many definitions describing the correct upright position. Authorities emphasized segmental alignment, pelvic inclination, carriage of the head and neck, the distribution of the weight of the feet, the curves of the spine, abdominal protuberance, the position of the chest, and the center of gravity in the trunk. When considered collectively, there seemed to be general agreement in the choice of criteria used to describe the conditions for "good" posture. [2]

Early (1909) research by Reynolds and Lovett determined the line of gravity of the erect body and related this line to the A-P spinal profile as determined by a spinal "conformateur."[3] In 1935 MacEwan correlated subjective ratings with various body measurements taken from photographs and by 1939 Hellebrandt and Braun had measured shifts of the center of foot pressure in both the sagittal (A-P) and frontal (lateral) planes. [4, 5] In 1959 Thomas and Whitney utilized a force analysis platform and accelerometer to relate center of foot pressure shifts with center of gravity deviations during normal standing.[6] Electromyographic measurements of postural muscles illustrating both static and dynamic aspects of erect posture were done by Joseph and Nightingale, Floyd and Silver, Nachemson , and Klausen and Rasmussen. [7-10] In 1971 R. R. Gregory, founder of NUCCA (1966), in conjunction with D. Seemann and P. Benesh, developed a prototype Anatometer to " provide objective leg-disparity data that could be correlated with postural, pelvic-distortion data while a patient was standing vertically in a load-bearing position". [11] Also in 1971 Stevens and Tomlinson used displacement transducers to measure postural sway. [12] In 2004 M. Dickholtz, Sr., a NUCCA certified doctor, presented at the spring NUCCA seminar results of his efforts to simultaneously make both frontal plane tilt and transverse plane

rotations of both shoulders and pelvis visible to patients by use of an optical-lever, laser- light system. Digital pre and post-adjustment photographs are taken and stored in patient files. Research is being done at the Medical University of Ohio located in Toledo, Ohio, under the direction of Dr. Vijay Goel, chairman of the University of Toledo's Department of Bioengineering, to determine relationships between Anatometer II plus measurements and state of the art postural measurement equipment recently designed at the University of Toledo.

Posture and Wellness

Kinesiologists have long been aware that postural problems are compounded by and correlated with less efficient locomotion. Sports fans have always marveled at the "fluid" and seemingly effortless motions of the very best athletes. But what is the relationship between posture and wellness? In a 1945 paper on body mechanics and posture, K. G. Hansson stated:

The medical profession was slow in accepting poor posture and poor health as one of cause and effect .In 1740 Nicholas Audry taught that many illnesses in children had their origin in imperfect body mechanics. …All surveys of posture in our primary schools show less illness, as proved by absences among children taught good body mechanics. [13]

Dickson credits Goldthwait, in speaking of posture and activity as saying:

To stand erect and walk and move easily, to have all parts of the body so adjusted that easy balance and graceful use may result, is to be desired for more important reasons than the esthetic. Such elements are necessary for perfect health and that we may use the body with least friction, the least expenditure of energy and with the greatest efficiency. [14]

It is worth noting that Goldthwait's statement is essentially equivalent to S. Gracovetsky's "objective function" model hypothesis that "expresses the idea that tasks are executed in such a way as to minimize and equalize the stress at each joint." If Gracovetsky's hypothesis is valid, then "the analysis of any task will reveal whether or not the subject is executing that task with minimum and equal stress." [15] Standing erect is such a task. Poor posture resulting from misalignment of C-1 requires compensatory movements by other parts of the body to maintain balance; thus energy is expended to counteract the effects of gravity.

M. Forrester-Brown (1935) states that " good posture is fundamental to health and to efficiency in every walk of life… (and) that the chief single factor in maintaining good posture is the tone of the abdominable muscles (which) balance the back muscles of the spine." [16] Although correlation between posture and wellness has long been noticed both in the chiropractic and in the medical profession, the advent of CAT and MRI scans, and the almost two dozen other types of scans has resulted in much less emphasis on posture in the medical profession, the major exception being scoliosis. Goldthwait (1915) hypothesized that in an anatomic and mechanistic conception of disease nearly all of the chronic conditions have an orthopedic facet to their solution. [17] Cochrane, who was associated with Goldthwait's clinic for nearly two years, explains Goldthwait's study as follows:

The hypothesis of the study was that many of the manifestations of chronic disease and ill health are due to the lack of the right elements of metabolism, or to absorption of the wrong elements of deranged metabolism, resulting directly or indirectly, from faulty function of the viscera due to improper use of the body in respect of posture. Such incorrect posture acts fundamentally by invalidating the normal support of the viscera. Many of the chronic conditions requiring treatment represent a derangement of the mechanism which regulates and maintains the proper and correct posture of the body. [18]

In 1917 Brown carried out a combined medical and postural examination of 746 Harvard students. Brown found that students having poor posture had seven times as many backaches as those having good posture. [19] In a 1921 paper on the effect of posture on the health of the child, Dickson gave the following conditions that he associated with poor posture: foot, knee, and leg ache, nervousness and irritability, fatigue and failure to gain weight, restlessness at night, and even constipation and gastrointestinal disturbances. [14] Cochrane stated that arthritis and gastrointestinal disturbances yielded to postural correction and concluded: "Problems relating to man's posture have a direct bearing on medical and surgical practice". [18] In a 1922 paper that appeared in Lancet, Thompson listed a number of conditions that may be "cured" through correction of poor posture. [20] In a 1932 paper, J.R. Garner suggested that good posture minimizes fatigue while building resistance to infections. [21] Affecting posture, however, in both a meaningful and predictive way has been elusive for health care professionals in all fields of practice. There is a long history of trying to relate x-ray measurements with postural measurements and postural and x-ray measurements with medically diagnosable "health" problems or a relief of disease signs and symptoms. Seaman and Troyanovich discussed this issue in a January 2000 article. [22] Having delineated a myriad of problems associated with poor posture, they ask; "What is our standard chiropractic approach for addressing poor posture? Unfortunately there isn't one that is universally taught in our chiropractic institutions." Continuing they state: "Unfortunately, there is little evidence to suggest that adjustments of any kind will substantially influence a patient's postural alignment. This leaves chiropractic between the proverbial rock and a hard place. We know posture is an important factor in health, but we have no real effective tools in our standard chiropractic arsenal to address the problem". [22]

Posture and NUCCA

It is the experience of upper cervical chiropractors (2-3% of all chiropractors) in general and NUCCA practitioners in particular that there is no anatomical region of the human body that is so commonly a first cause of postural problems as the upper cervical spine. Specifically this first cause is itself often the effect of injury from trauma, surgery, applied mechanical forces, or even age itself. This site of injury can be at any location; either above, at, or below C-1. The C-1 joint, composed of C0-C1-C2, is the focus of upper cervical work. It is well known that at no other location in the spine are the joint mechanoreceptors as dense, motion so allowed, and structures below and probably above so dependent. [23-26] NUCCA's forte, even among the other upper cervical specific groups, has been to deal directly with postural imbalance. Indications when to and when not to intervene are dependent upon postural measurements. The direction of vectored manipulation, the how to intervene, is dependant on X-ray analysis and an understanding of biomechanics and patient abnormalities.

The National Upper Cervical Chiropractic Research Association (NUCCRA), NUCCA's research branch, has dealt with measurement and analysis of postural imbalance due to a disarrangement of the upper cervical spine since 1971. [27] Measurement on X-rays of the disarrangement of C-1 is correlated to postural imbalance which is determined by measuring the existence of a physiological or apparent leg length differential on a patient while the patient is in a supine position. In all cases, patients that have X-rays presenting at least three-quarter of a degree or more of atlas laterality have a measurable leg length differential or contractured leg. [28] In a landmark article in The Upper Cervical Monograph, A. Berti , using a chart-reading thermocouple instrument called the Analgraph, found a direct relationship between incremental deviations on the graph and apparent leg length differential. For each one-increment deviation on the graph there was 1/8th of an inch leg length differential.[29] There is agreement in the literature that a 3/8th of an inch or more of a contractured leg is positively correlated with a C-1 subluxation . [30]

The Gregory hypothesis for the existence of a contractured leg is that it is the result of the imbalance between the facilitatory and inhibitory neurological mechanisms in the brain stem resulting in spastic contracture of the extensor muscles. H.W. Magoun states that the central reticular formation of the brain stem exerts ascending and descending influences upon the cerebral cortex and upon the motor outflows from the spinal cord. The more cephalic of these connections facilitates spinal motor discharge while the more caudal region exerts an inhibitory action, and the imbalance in these extra-pyramidal motor connections is thought to be responsible for spasticity in which condition inhibitory influences are no longer active while the facilitatory connections, being unopposed, exert an augmented effect. [31] In a speech given at the Palmer College of Chiropractic in 1977, R.R. Gregory states

If this (Magoun) is true, and NUCCRA research has verified it, then the appearance of spastic contracture in the skeletal musculature should be accompanied by imbalance between the inhibitory and facilitatory mechanisms of the brain stem. What would cause such imbalance from a subluxation standpoint? The only answer to this question is: tractionization of the brain stem by a C-1 subluxation. We found that both lateral and longitudinal tractionization could be demonstrated to exist. That is, the contents of the cervical canal could be stretched by a C-1 subluxation and the displacements or misalignments of the subjacent cervical vertebrae as they deviated into the frontal and transverse planes of motion from the vertical axis of the body. Such tractionization could exist upward into the brain stem, producing imbalance between the two neurological mechanisms or motor connections. As inhibitory control was reduced to the skeletal muscles, spastic contracture resulted from a C-1 subluxation which in turn distorted the spinal column. If a C-1 subluxation is capable of causing tractionization that would produce imbalance within the CNS, a correlation should exist between C-1 subluxations and the distortions in the body produced by the spastic contracture resulting from C-1 tractionization effects on the neurological mechanisms. We have found that without exception such correlations do in fact exist. When, for example, a transverse rotation of the pelvis exists in a patient a corresponding misalignment factor in the patient's atlas subluxation exists controlling that body distortion. It may be found that atlas laterality causes pelvic rotation in some cases; in others it may be established that abnormal excursion of the pelvis into the frontal plane is the result of atlas rotation. This fact should point up to you the great importance of accurately analyzing films, the great importance of the misalignment factors, and the great importance of precise adjusting.[32]

Steindler in his 1955 Kinesiology of the Human Body Under Normal and Pathological Conditions *defines spastic contracture as 'the cessation of the functions of inhibitions which normally regulate muscle tone.'[33] Thus one sees spastic contracture when an imbalance exists between the neurological mechanisms in the brain stem because the inhibitory and regulatory control to the skeletal musculature is reduced by the atlas subluxation. Steindler's definition is collateral with Magoun's explanation in that imbalance between the facilitatory and inhibitory mechanisms causes cessation in full or in part of the inhibitory influences from the brain stem that regulate muscle tone. C-1 is located at the caudal end of the brain stem; therefore it is logically in that position that would permit, when misaligned, of interference with the normal function of inhibitory influence on the skeletal musculature, causing over-innervation of the motor units of the spinal cord and resulting in bodily distortions, malalignments of the spinal column from its true vertical axis. Steindler, in his Theory of Contractures, states that over-innervation of the motor units of the spinal cord, due to the existing imbalance between these two brain stem motor mechanisms, constitutes the pathology- the pathological element.*

Thus, the C-1 subluxation has an established pathological element which is over-innervation. As the only way that over-innervation can be removed from the motor units chiropractically is by maximal correction of the atlas subluxation, any so-called adjustment of any vertebral segment below atlas fails to be an adjustment because it cannot correct over-innervation, the pathological element of the subluxation. [32]

The historical NUCCA/NUCCRA position is that the C-1 subluxation is totally responsible for spastic contracture of the musculature, distortion of the spinal column from its true vertical axis, pelvic misalignment into the transverse and frontal planes of motion and therefore displacement of the pelvic center of gravity, distortion of the effect of the gravitational forces of the body, the contractured leg, and that the atlas subluxation is a physical stressor; a C-1 subluxation is the primary and controlling subluxation and thus the most damaging and far -reaching subluxation in the spine. The cause of over-innervation is not at the neurological level of the suspected vertebra but at the level of the foramen magnum. It should be noted that R.R.Gregory intentionally left a reasonable degree of latitude in the possible etiology of the C-1 subluxation, realizing that many years would probably pass before research in the scientific community would explain the neurophysiology. It should be noted that Gregory was well aware of research by A. Brieg. [34, 35]

Recent research by M. D'Attilio et.al., suggests that C-1 tilt can be induced superior to the atlas by dental occlusion; in this research 100 percent of the test group (N=15) that "wore an occlusal bite pad…on the maxillary right first molar" developed a scoliotic curve. According to the authors, "the scoliotic curvature observed in our sample was probably related to the consequential tilt of the first cervical vertebra(C-1)(probably atlas laterality) which affects the tilt of adjacent vertebra, destabilizing the vertical alignment of the spine."[36] A review article by Korbmacher et. al., states that "The literature is consistent in reporting a high prevalence of pathologic orthopedic findings with an orthodontic treatment need." and further states that "The high prevalence of orthodontic findings in patients with deformities of the cervical spine reported unanimously in the literature suggests interactions between the disciplines of orthodontics and orthopedics."[37] NUCCA 's position would be to substitute "upper cervical specific" groups which includes NUCCA, Orthospinology, and Atlas Orthogonal for orthopedics. NUCCA practitioners in general appear to have a more rigorous system with more pervasive and refined posture measurements, more meticulous X-ray procedures, and consistently better corrections as evidenced by its certification process and standards.

Posture and its Measurement by NUCCA

The key clinical research instrument relating standing body posture in 3-dimensions to X-ray findings has been the Anatometer. The Anatometer was designed and built to test the hypothesis that the contractured leg (usually referred to as LLI or high or short leg) is not caused by an isolated pelvic distortion alone but rather by disarrangement of the C-1 joint. [38] Use of the Anatometer II and II plus yields measurements of standing pelvic angular displacements in both transverse and frontal planes, angular displacement of the "fixed" point (located at either T-1 or C-7) from the vertical, pelvic width, ilium height, and percent weight differential on the load bearing foot plates. [11] Early Anatometer studies found the following: "1. The pelvis posturally distorts into both the frontal and transverse planes when the patient has an atlas subluxation as determined by X-ray analysis. 2. As the X-ray measured atlas subluxation parameters are reduced, the Anatometer listings of the patient are also reduced. 3. When the subluxation listings (laterality, rotation, etc.) are reduced to zero the pelvic distortion eventually returns to zero in both the frontal and transverse planes."[39] These results led R.R. Gregory to state in April 1976: " The NUCCRA research work accomplished over the last five years with the use of the (prototype) Anatometer as a data retrieval instrument has established the basic NUCCA hypothesis that C-1 subluxations can be responsible for neuromusculature problems which causes spastic contracture of skeletal muscles and resultantly, bodily distortions." [40] Norman Thomas (ICCMO), building upon C.S. Sherrington [41], has theorized that an ascending muscle reflex phenomenon accompanies the bodily distortion into the skull causing shift of the weight distribution of the temporal mandibular joints leading to dental malocclusion. Uncorrected, the potential for development of cranial mandibular dysfuncton (cranial mandibular disorders) increases. Clinical attempts to correct malocclusion in the ascending cranial mandibular disorder patient without realignment of the occiput/atlas/axis joint complex has limited the response of the patient to conservative dental procedures, including dental orthotics (splint therapy) (Ascending/ Descending Cranial Mandibular Disorders).[42] Shoe heel lifts on the contractured leg side, although providing support of weight distribution at the foot, do not correct pelvic angulations.

The prototype Anatometer was capable of one significant measurement that later versions of the Anatometer did not have. The prototype had vertically moveable footpads. A significant observation was made with use of the movable footpads: A new patient could be placed on the Anatometer and the difference in vertical distance between the two footpads could be altered until the patient would balance in the transverse (horizontal) plane as measured with the "hip calipers". [43] This was found to be the end position resulting from the complete elimination of the C-1 disarrangement and of the Atlas Subluxation Complex Syndrome. Whatever imbalances were left in the frontal plane were due to other factors such as an anatomically short leg, true scoliosis, micro-fiber build up in muscles, and yet to be determined unknown problems such as malocclusion. Using foot lifts to compensate for the amount of imbalance in posture associated with C-1 joint disarrangement is considered unnecessary and potentially deleterious to the patient. Potential

causative factors of postural imbalance originating above C-1 have not yet been considered by NUCCA. Clinical postural measurements always consist of a supine leg check to determine the side of the contractured leg and, when available, the set of Anatometer measurements or other postural measurements. Neurocalometers, neurocalographs, infrared units, or surface electromyography are often used in NUCCA practices to help in analysis.

A Brief History of NUCCA's Modus Operandi

No one less than Hippocrates himself discussed that complex three-dimensional structure called the human spine. He wrote about supportive connective tissue, muscles, vertebrae, and discs. In a normal state vertebrae, discs, ligaments, and muscles work together to protect the spinal cord, provide flexibility, and transmit loads. Due to injury these structures undergo changes leading to disarrangement of the spinal column. Hippocrates noted disarrangement by writing about rotation of the spinouses and alteration in spinal curves in both frontal and transverse planes. He noticed, for example, that "cases when the (spinal) curvature is below the diaphragm are sometimes complicated with affectations of the kidneys and parts about the bladder…" [44] Attempts to correct these perceived asymmetries have existed for millennia. Egyptians have "replaced" disarranged vertebrae for at least 3000 years and the Chinese for at least as long. [44] Chiropractic from its beginnings in the United States over a hundred years ago realized that structural and relational asymmetries were associated with structural "interferences" or positional disarrangements. By the mid 1930's the upper cervical area had become well identified as the major area of interference. Inability to consistently define and most importantly reduce or correct these "subluxations", meaning less than a luxation or dislocation, resulted in a growth in empirical trial and error efforts and a movement away from upper cervical specific as the primary "technique".

In 1941 John F. Grostic and Ralph R. Gregory began research into addressing problems in the upper cervical spine. Gregory reviewed The Atlas Specific by A.A. Wernsing which mentioned that the atlas could be seen to move laterally on the occipital condyles "as on the rim of the circle" [45]. Grostic realized that measurement of disarrangement could be measured in degrees! M. Thomas in NUCCA Protocols and Perspectives provides a simple description of the discovery process, part of which is the following:

"In order to measure angles, the entire idea of measurement in the spine had to be reconceived. Instead of measuring how one bone moved in relation to another bone, Grostic reasoned that a line passing through the vertebrae could represent the positions of the bones of the spine. The relationship between individual bones is then more easily realized by measuring the angles formed by these lines. The idea of attempting to measure how far one bone had moved over the top of, or underneath another bone (a segmental analysis) was being replaced with an analysis of how the structures moved together. Dr. Grostic soon realized, when examining the film of an AP view (called nasal cavity or A.P. view in the 1940's; now called a nasium view) of the head and neck, that he could pick out like-points on both sides of the skull and bisect them, creating a line that could be represented as the center of the skull in the frontal plane. This line came to be known as the "central skull line". Grostic also realized that the shadow of the superior articulating surfaces of the axis on the nasium view could be represented as part of the rim of a circle. Each of the cervical vertebrae could be seen to misalign in a direction determined by the displacement of this "axial circle". The atlas was seen to "sit" between these two "circles" On the nasium film, the atlas position could be represented as a line (tangent) between the two circles of (usually) different sizes. A line could also represent the direction of the disarrangement of the lower neck (or cervical spine). This was a mathematical relationship that could be understood. Force applied to the transverse process of the atlas could be raised or lowered to move the structures represented by the circles in such a way that the head and neck could be anatomically returned to a normal position in the midline. This midline represented the center of the neural canal. The "subluxation" was now measurable. Equally important, the effects of the adjustment were becoming measurable on the post X-ray .It was soon seen that the nasium X-ray view revealed lateral "side-slip" (atlas laterality) of the atlas up one side of the occipital condyles ("moving as if on the rim of a circle") creating an acute angle when compared with the central skull line (angular measurement)."[44]

Additional measurements were taken on the nasium view. When combined with additional measurements from a vertex view, including a rotational measurement of the atlas (atlas rotation), and a lateral view, a three-dimensional clinical model could be visualized. Through empirical studies of thousands of cases, and with an accounting for anatomical asymmetries and abnormalities, a calculus from which a unique adjustment vector could be made for each individual case was developed. By 1946 the first class of "Grostic" was given in Ann Arbor, Michigan.

Gregory was able to independently develop or improve upon both the accuracy and precision of all levels of analysis of the "Grostic" system by .1) development of a double-pivot-point system in X-ray analysis (1962), 2) development of a more effective tricepts pull adjustment(1965), 3) establishment of a vertical axis as normal(1965), 4) realization of the rotation of the subjacent cervical vertebra due to axis spinous rotation and cervical spinal deviation from the vertical axis (angular rotation)(1968), 5) design of better film analytical instruments, 6) development of the predominant factor theory(1970), 7) design and development of the Anatometer which reduces the need for X-rays (1978), 8) classification of C-1 subluxations into basic types(1980), 9) realization that the occipital-atlanto-axial relationship is a lever system and the identification of this lever system (1981), 10) identification of the components of the lever system and their relationship inherent in an occipital-atlanto-axial subluxation(1981), 11) establishment of specific patient placement to fit

the biomechanics of each of the four basic types(1981), and 12) realization of out-of-pattern basic types and their most common etiology – manipulation by others (1983). [46] These improvements resulted in a precision sufficient enough to show that actual changes had been made in lessening the disarrangement of C-1 as determined from X-ray analysis.[47]

NUCCA GLOSSARY OF TERMINOLOGY *

Atlas Subluxation Complex (ASC). This term is a neologism intended to denote the far-reaching and damaging effects of the subluxated occipital-atlanto-axial area of the cervical spine upon the spinal column and the human organism. It differs in meaning from the commonly used chiropractic term "atlas subluxation" or "atlas-axis subluxation" in that the term Atlas Subluxation Complex embraces the demonstrable mechanical and neurological phenomena which, through research, have been found to be associated with subluxation of the occipital-atlanto-axial spine. The term includes the atlas vertebra in all its planes of misalignment, its positional relationship to the occiput, subjacent vertebrae and pelvis, inclusive of the excursions of the structures into any or all of the bodily orientation planes; resulting in, or capable of resulting in, concomitant detriment to the susceptive neurological components.

Atlas Subluxation Complex Syndrome: The term is limited in meaning to include only the observable and measurable signs of an Atlas Subluxation Complex. The Atlas Subluxation Complex Syndrome is the group of signs which are always present and measurable in proportion to the intensity of the Atlas Subluxation Complex. This group includes misalignment factors as shown by X-ray, resulting traction of the neurological component, presence of spastic contracture of the lumbar and pelvic musculature, distortion of the pelvic girdle, displacement of the body's center of gravity, contractured leg, and deviation of the spinal segments from the vertical axis of the body.

Neurological Component: This term includes that nerve structure which is deformed by traction, enfoldment, and/or compression resulting from the effects of the misalignment factors of the vertebrae, occiput, and pelvic girdle regardless of the location of the nerve structure: skull, spinal column, or that nerve structure emitting through foramina of the skull and/or spinal column.

Vertical Axis: The Vertical Axis is formed by the intersection of the frontal and sagittal planes of motion. It is perpendicular to the ground. In the "normal" spinal column the Vertical Axis passes through the center of gravity located in the pelvis at the point where all three planes of motion intersect. The pelvic girdle, occiput or skull, and/or any spinal vertebrae can be considered as normally positioned when aligned with the vertical axis and the parts proportionately influenced by gravitational stresses. Standard anatomical position is assumed.

Normal: The NUCCA procedure incorporates a system of measurement on X-rays that makes possible the location of the relative position of the atlas. When the relative position of the atlas is such that there is a removal of the Atlas Subluxation Complex Syndrome for the greatest period of time, the Atlas is then said to be in its "normal" position. On X-rays a "corrected atlas" is seen to be centered on or nearly on the determined vertical axis.

Atlas Laterality: A rotational abnormal movement of C1 about the condyles of occiput and about the sagittal axis of motion. Rotation is angular motion about an axis of motion.

Atlas Rotation: The abnormal excursion of the cervical spine and skull as a unit about the vertical axis of the body and into either the right or left frontal plane of the body, thereby producing gravitational stresses resulting in rotations of the vertebrae and tractionization of the contents of the spinal canal and nerve root.

• Additional descriptive terminology can be found at: http://www.nucca.org/articles/bio_nucca_glossary.htm

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Upper Quarter Finite Element Modeling Proposal for NUCCRA

By Jim Palmer

***(Editors Notes:** This is the introduction to the proposal submitted by UCRF to the University of Toledo's Department of Biomechanical Engineering for the first two years of the spinal modeling project. Segments of information were taken from sources such as the December 2006 issue of JMPT which contained the most recent set of chiropractic white papers, textbooks, NUCCA literature, and public documents. The dentistry section was supplied by the late Dr. Michael Mazzocco of The International College of Cranio-Mandibular Orthopedics (ICCMO). This paper consists of two basic components. The first component (pp15-18) uses the author's perception of NUCCA's relationship with the large list of non-vectored techniques in contemporary chiropractic to address the potential apparent problem of NUCCA not fitting the mainstream (dominant) chiropractic paradigm. The intended purpose of the first part is to inform the scientific community at the University that NUCCA has an unconventional position and that knowing so can lessen confusion when reading the chiropractic literature. Once that is addressed, the second part of the paper begins with the specific aims of the research proposal. (References have been omitted..)*

Statement of Strategy

The uniqueness in every aspect of upper cervical specific chiropractic as epitomized by NUCCA relative to mainstream chiropractic , its very minor role in today's chiropractic practice, its far reaching effects on symptoms and pain on both the entire spine and the human body, its totally misunderstood paradigm, its paucity of publication in indexed, referred-journals , its level of difficulty in mastering its practice, its emphasis on posture, and the relative importance of adjusting C-1 relative to the entire spine, requires an unconventional research proposal format. Everything about NUCCA and upper cervical specific in general is contrary to the controlling forces and the dominant paradigm in chiropractic.

State of Chiropractic

Since 1995, chiropractic has been increasingly viewed closer to the mainstream of health care; however, less than 7% of chiropractors report practicing in multidisciplinary settings. Debate continues over whether chiropractic should see itself as "complementary" or "alternative". Chiropractic continues to be the most established of the alternative health care disciplines. Because of issues surrounding the small magnitude of effects in outcomes literature for spinal manipulation (SM), potential erosion of cost advantages over conventional medicine in low back treatment, and continued lack of clarity internally about chiropractic's role in health care, the profession is confronted with a number of challenges. Reimbursement is shrinking while the number of DCs is increasing and mainstream disciplines are becoming increasingly competitive. Chiropractors appear to recognize the importance of research of outcomes and cost-effectiveness to their future. The health care industry is in the midst of significant and certain movement toward evidence-based medicine processes. The most influential clinical research studies over the past decade have provided evidence in the areas of low back pain (LBP), neck pain (NP), headache, other musculoskeletal conditions, and non-musculoskeletal conditions. The overwhelming majority of chiropractic services are for musculoskeletal back and neck pain conditions yet DCs identify themselves as being strongly connected with primary and preventative services. The International Chiropractors Association (ICA) labels chiropractic as the fastest growing and second-largest primary health care profession.

The clinical condition most commonly addressed by studies is LBP. Among complimentary and alternative medicine (CAM) therapies for back pain, massage was rated most helpful. Users of chiropractic reported treatment-related "significant discomfort, pain, or harm" more often than users of other therapies (for back pain). Based on literature and a group of chiropractic scholars, the three (3) most studied adjustive procedures for low back pain are side posture (high- velocity, low-amplitude {HVLA}), distraction (mostly flexion distraction), and mobilization, respectively. The specific procedure with the widest base of evidence support for addressing LBP is HVLA side posture manipulation. Other procedures with evidence of effectiveness were distraction technique and HVLA prone with drop table assist. The three (3) procedures rated least effective based on the evidence were upper cervical technique, non thrust reflex/low force, and lower extremity adjusting.

In October of 1991 the National Upper Cervical Chiropractic Association (NUCCA) submitted a position paper for the Conference for the Establishment of Guidelines for Chiropractic Quality Assurance and Standards of Practice (Mercy Conference: San Francisco, January 25-30, 1992) chaired by S. Haldeman; the result of that conference was Guidelines for Chiropractic Quality Assurance and Practice Parameters, a document not friendly to upper cervical chiropractic procedures such as NUCCA which use pre and post X-ray analysis. The ICA, the World Chiropractic Alliance, and the Council on Chiropractic Practice (CCP) are politically attuned to "subluxation-based care" (as distinguished from care that incorporates

patient condition and diagnoses into management decisions). The ICA supports maintaining and promoting chiropractic's "unique identity as a non-therapeutic…health science". The power in control of chiropractic, however, is embodied by the American Chiropractic Association (ACA) which is not supportive of subluxation- based care but is focused on site of pain, spinal manipulation therapy (SMT), range of motion, palpation, and avoidance of X-rays.

Paradigm Differences

Spinal manipulation (SM) is the main method used by chiropractors, osteopaths, and physical therapists to treat musculoskeletal disorders of the spine. SM generally involves the applications of manual loads to specific locations of the spine with the intent to induce intersegmental motion with an intended therapeutic effect. The mechanical characteristics of spinal manipulation can vary in terms of its duration and amplitude, its anatomical location, choice of levers, and direction of force. Loads that produce vertebral motions stretch or compress ligaments, discs, and muscles. These anatomical structures contain sensory receptors which respond to changes in mechanical and chemical conditions and provide input to the central nervous system. There is evidence suggesting that mechanically stimulated neural responses, in particular, are important elements of the mechanism of action of SM. The mainstream chiropractic spinal manipulation therapy (SMT) paradigm is one of locating fixations by palpation and then treating by SMT a given spinal segment or adjacent segment believed to be the site of the fixation and thereby addressing regionally perceived pain; by definition it is the spinal segment or region that is fixated and correlated with the site of pain that is the problem. Clinical studies have shown mixed results at best regarding the effectiveness in employing this paradigm. The perception is that if the research studies were more complete and better designed then the predictions would be more certain and the mechanisms more clear. The effectiveness of pain and symptom relief constitutes the primary focus in chiropractic SMT literature while range of motion is a secondary focus and is a consequence of undoing a fixation. Consequently the literature does little to either suggest plausible mechanisms or to provide results that are predictable with any reasonable degree of certainty.

For chiropractic SM this situation is exacerbated by techniques numbering in the hundreds. The National Center for Complementary and Alternative Medicine (NCCAM) has identified the need to biomechanically characterize manipulation procedures as an important area of research. (A good place to start on mainstream chiropractic is the basic science white paper issue of JMPT Vol. 20, No. 3 1997 followed by the research agenda in the special white paper issue of JMPT Vol. 29, No. 9 Nov./Dec 2006) Every technique has its miraculous results as evidenced by publication of case studies in some venue such as the Journal of Manipulative and Physiological Therapeutics (JMPT). These results are miraculous not only for the patient but also for the chiropractor because the chiropractor has almost no idea of why what happened actually happened and because of the small magnitude of the frequency of such results. What is not accomplished by chiropractic SM is left for the innate to solve. Chiropractic SM is handicapped by its paradigm which focuses on the spinal segment or region that is the site of the fixation and pain as being the problem and on medically defined symptoms, thereby automatically de-emphasizing, except for range of motion, the biomechanics. In chiropractic SM, if there are multiple spinal segments or regions of pain and fixation as determined mainly by palpation, then all of these sites or regions are manipulated; that is chiropractic's SM full-spine technique. In summary, contemporary chiropractic spinal manipulation therapy (SMT) operates under the paradigm of applying loads to specific locations which are sites of pain and fixation with the intent to induce intersegmental motion and thereby to relieve pain and alleviate symptoms while increasing the range of motion.

The NUCCA paradigm, however, emphasizes biomechanics by addressing what is normal in the position/location of spinal elements (especially cervical spinal elements) and by posture. NUCCA defines normal not by lack of pain, absence of medically defined symptoms, or by degree of the range of motion but by an anatomical normal in both spine orientation and external body postural orientation. Anatomically defined spinal normal requires, for example, that in an A-P X-ray view that both the cervical spinous processes and a central skull line which bisects the skull in the frontal/coronal plane are aligned to a gravitational vertical. Left and right frontal/coronal plane spinal symmetry is assumed to be normal. A postural orientation anatomical normal requires that in the standard anatomical load bearing position, for example, a level pelvis (frontal plane), no rotation of the pelvis (transverse plane), and no lean of the head and neck off a gravitationally defined vertical (frontal plane). Postural normal requires a neurological normal which necessitates less than 0.75 degrees of atlas laterality (side slip of the atlas in the frontal plane around the condyles of occiput.) The Grostic-Gregory-NUCCA paradigm does not dictate the "normal position" of the atlas. It provides a system of measurement that makes possible the locating of that position of the atlas that results in the removal of abnormal clinical findings for the greatest period of time. This measurement procedure has made it possible to observe clinically the effects of various positions of the atlas on the findings of clinical tests. While normal is somewhat variable, it is not as variable as one might think. The more closely the atlas is positioned toward the biomechanical normal the longer the patient's clinical findings remain normal. This normal happens to be an anatomical

normal in both spine orientation and external body postural orientation.

Because NUCCA is biomechanically oriented in this respect the measurement of the degree of success in the vectored manipulation requires both pre and post measurements anatomically; that is, both pre and post adjustment measurements by X-ray of the cervical spine and both pre and post adjustment measurements of posture by non-load bearing (supine leg check) and load-bearing (Anatometer) methods. The same set of pain, medically defined symptoms, and range of motion (not usually done by upper cervical chiropractors) of mainstream chiropractic are found to resolve, at least to the same degree, as a result of only vectorially manipulating "directly" the atlas.

A recent study, *Atlas vertebra realignment and achievement of arterial pressure goal in hypertensive patients: a pilot study*, unequalled by anything in the mainstream paradigm, shows significant lowering of blood pressure in Level I hypertension cases associated with adjusting the atlas via NUCCA protocol (Journal of Human Hypertension advance online publication, 25 January 2007; doi:10.1038/sj.jhh.1002133). This article indicates (1)that changes in the "anatomical position of the Atlas vertebra and subsequent changes in the circulation of the vertebral artery lend itself to worsening of hypertension", (2)that because displacement of C-1 is pain free, the displacement remains "undiagnosed and untreated whereas health-related consequences are attributed to other etiologies", (3) that " minor misalignment…can potentially injure, impair, compress and/or compromise brainstem neural pathways", and (4) that both rotational and lateral positioning and postural anatometer measurements remained unchanged for the control group. In an unpublished study on patients diagnosed with chronic fatigue a NUCCA atlas adjustment was significant in lowering cortisol levels to within the normal range of values.

A vectored manipulation requires a known direction and "point" of application of a force. An adjustic technique called the triceps pull was developed by Gregory to permit manual reproducibility of force direction and to let the spinal resistance encountered determine the magnitude and displacement (depth) of the applied force and therefore the amount of energy transferred. Vectored manipulation, unlike mainstream manipulation, requires that the patient placement for X-rays and the analysis of X-rays be reproducible. NUCCA vectored manipulation, unlike SMT which uses X-rays only to determine if there are any contraindications for manipulation, also uses the X-rays to determine the calculus of the direction of the required force for correction to or toward the normal with misalignment factors reduced proportionately. X-rays are used to determine the spinal misalignment because palpation has insufficient specificity. Because the displacement is to or toward normal the vectored manipulation is termed an adjustment. Manual manipulation has less specificity in direction, magnitude, and "point" of application of the force than NUCCA (manual) vectored manipulation. Instruments used for vectored manipulation in the upper cervical region allow control of the magnitude, direction, and "point" of application of the force and when a similar X-ray analysis to NUCCA is done the adjustment usually shows approximately 50-55 percent correction instead of 70 percent or better correction of the skilled NUCCA practitioner. Symptom resolution has been found to be monotonically increasing with increased reduction of misalignment of C-1. Clinically, it also has been observed that there is usually no correlation between the magnitude of the upper cervical misalignment and the severity of the patients' symptoms.

Misalignment patterns or subluxation patterns are correctable but physical stress potentially may recreate a similar but less pronounced misalignment patterns both as measured on X-rays and on postural measurements. Verification of the persistence of these patterns over time obviates the needs for continual post X-rays. NUCCA has discovered and developed an understanding of four basic pattern types seen on X-rays along with an understanding of out-of-pattern types, many of which are thought to be caused by health providers such as chiropractors using SM in the cervical region. Palpation by chiropractors using SM is unable to indicate the type of basic biomechanical pattern let alone the degree of upper cervical misalignment within a basic type.

In November of 1987 the International Chiropractors Association (ICA) adopted the following definition of subluxation: "Any alteration of the bio-mechanical and physiological dynamics of the contiguous spinal structures which can cause neuronal disturbances". The American Chiropractic Association(ACA) definition of subluxation goes even further: " An aberrant relationship between two adjacent structures that may have functional or pathological sequelae, causing alteration in the biomechanical and/or neurophysiological reflections of these articular structures, their proximal structures, and/or other body systems that may be directly or indirectly affected by them". (It is noted that the ACA definition intrinsically does not preclude static measurement.) Medically, a subluxation would be categorized as an arthrosis, that is, a physiological imbalance or a joint failure in which mechanical factors play a role. NUCCA uses the phrases Atlas Subluxation Complex (ASC) and Atlas Subluxation Complex Syndrome. The ASC is the mechanical and neurological phenomena which are associated with the subluxation of the occipital-atlanto-axial spine; the ASC Syndrome includes only the observable and measurable signs of the ASC – contractured leg, X-ray misalignment factors, deviation of spinal elements off the vertical axis, distortion of the orientation of the pelvic girdle, and displacement of the center of gravity. By definition, disease is " a failure of the adaptive mechanisms of an organism to counteract adequately the stimuli and stresses to which it is subject, resulting in a disturbance

in function or structure of any part, organ, or system of the body". In this light NUCCA considers "poor posture" as the major external indication of a disturbance in function or structure sufficiently important to focus on while relegating symptoms, pain, range of motion, and palpation findings, all of which are patient conditions to being of secondary importance. Because these non-postures, "patient conditions" have little to do with patient management decisions for NUCCA practitioners, NUCCA is a subluxation-based chiropractic paradigm.

The NUCCA adjustic process is unique relative to mainstream chiropractic. Subjects are adjusted in side posture at the level of the atlas. External forces include the force of the head piece on the head, the force of gravity on the center of mass of the skull/head, and the applied force of the adjustor. It is not known to what degree force is transmitted to the upper cervical spine from other spinal forces that result from body contact with the table used in side posture. Neither is it known to what degree there is coupling between the force of the headpiece and the applied force of the adjustor. The magnitude of the adjustic forces are not known but are estimated to be in the range of 20-140 Newtons (N). A given force in a particular misalignment pattern is hypothesized to be exactly the correct magnitude in an optimum direction that is necessary to overcome internal resistance(s) of the subluxation and that result in movement to or towards normal. The ability to generate higher forces when necessary is one characteristic of the capability of the better adjustors. Characteristic force-time curves on the "practice coordinator" that has transducer based output are similar for premier adjusters.

Two broad categories of SM exist: high velocity low-amplitude (HVLA) procedures, and low-velocity variable-amplitude (LVVA) procedures. HVLA procedures deliver forces in a quick thrust with loading durations on the order of 100-200 ms with approximately 200-500 Newtons (N) force. Mainstream chiropractic calls HVLA-SM "adjustments". LVVA procedures deliver a combination of regional spine loads and forces, usually in the range of 80-200N, at localized vertebral levels at a slow rate of loading and are applied cyclically over a long duration on the order of 4-20 seconds. Mainstream chiropractic calls LVVA-SM maneuvers "mobilization". Those different SM procedures vary with respect to the point of application of the load, and the directions along which the loads are applied. Variations abound with both HVLA and LVVA procedures; such variations may have clinical repercussions if mechanically sensitive tissues are affected in different ways. NUCCA's position is that the unique set of upper cervical tissues with the high density of receptors makes HVLA procedures such as toggle recoil potentially problematic in that area.

NUCCA practice does not appear to fit into either of the broad categories. Issue is taken with providing ranges of force and time (and therefore ranges of impulse and change of momentum) but yet describing the categories with amplitude and velocity which when coupled with forces suggests power. It is the amplitudes (displacements) and magnitudes of the forces that are not controlled and therefore the energy in SM; the wide range of directions of applied forces just compounds the problem. A NUCCA adjustment (tricepts-pull delivery) does typically last 1-2 seconds; most of which is in a preload phase, the force of which is gradually increased while reaching a peak that is followed by a 50-200 ms drop off to zero, but the depth (displacement) is only a few millimeters, resulting in an input of energy on the order of less than 0. 5 Joules (100N X .003m= 0. 3 J). It is not known how much of the applied energy input is effective. The skin surface contact area is not known but is estimated at 12-20 cm squared. It would not be unreasonable to have one to two orders of magnitude less in the effective energy input. One known cineradiography of an articulation using the NUCCA technique shows the C-1 joint moving after the adjustment skin contact has ceased.

Dysfunction of the spine that has been treated by chiropractors, in general, is described as the vertebral subluxation complex which has myologic, connective, vascular, neurologic, and lymphatic tissue involvement. It is hypothesized that a fundamental component of the vertebral subluxation component is the development of adhesions in the zygapophysial joints (Z joints) after hypomobility of these structures.

A. Specific Aims

The general aim is to evaluate the mechanism(s) of spinal fixation and the biomechanical effect of spinal adjusting at C-1 on the cervical spine, the spinal cord, the mandible, and the pelvis.

Specific Aim 1. Measure the vertebral motions and facet joint surface strains in the human cervical spine in response to simulated spinal adjusting at C-1 (and possibly at C-2) of varying biomechanical variables: load magnitude and direction, vertebral contact location and load, preload, duration of contact, load oscillation, head support load and contact location, and center of gravity of skull/head weight for an orthogonally aligned cervical spine and for various cases of a misaligned cervical spine including all four basic types.

Specific Aim 2. Test the hypothesis that mechanical loads (external), motion and spinal posture deviations from the normal will lead to abnormal loads in various tissue of the spine or TMD (TMJ) or facial bones or all of these. Since most of these structures have nociceptors, these changes can lead to increase/decrease in pain. These stimuli will also change pressure on the spinal cord/nerve roots. The trigeminal nerve and the vagus nerve are of special interest.

Specific Aim 3. Develop and validate a 3-D, non-linear finite element model to estimate the strains of discs, internal spinal ligaments (e.g., the dentate ligament) under simulated adjusting loads, to measure vertebral displacements, and to correlate stress and strain results with various adjusting loads.

Specific Aim 4. Develop a 3-D jaw, mandible, skull finite element model to define the biomechanics of TMD (TMJ) and to determine its elements of connectivity and relationships to the Atlas Subluxation Complex.

B. Background and Significance

B.1-3 Effects of Adjustment at C-1

Adjusting at C-1 is a biomechanical event with both biomechanical and neurological consequences. C-1 loading itself changes the relative position of the vertebrae and stretches interconnecting tissues: skin, muscle, ligament and disc. Mechanoreceptors in these tissues can transduce the change in length and send input to the nervous system. In some theories about the effects of adjusting or SM, this neurological input is the main means of inducing healing and restoration of spinal function. Muscular reflex responses have been noted within milliseconds of a manipulative thrust in normal, pain-free subjects. There are also short-lasting changes in spinal reflexes, decreases in spontaneous activity in paraspinal muscles and changes in muscle strength following SM. It has been shown that ligaments provide important information about spinal position and drive protective reflexes. Hence identifying which neurally responsive tissues are involved and the manner in which they are affected by SM is crucial to further understand its mechanism(s). SMT typically results in a higher number of visits than does upper cervical specific care. This may be because manipulation is usually provided with little regard to alignment integrity and spinal stability. Specific upper cervical adjustments such as by NUCCA attempt to facilitate normal spinal biomechanics and neurological integrity

Experimental evidence from cadaver studies indicates that HVLA manual thrusts produce intersegmental rotations on the order of 0.2 degrees and displacements on the order of 0.5mm in lumbar vertebrae during surgery in response to 5 ms impulse with loads ranging from 35-150 N. NUCCA X-ray measurements indicate relative intrasegmental side slip of the atlas around the condyles of occiput in the frontal plane (atlas laterality) with a mean on the order of 2.6 degrees which corresponds to approximately 0. 6 mm displacement on an X-ray nasium film. About one half of the cases showing postural distortion have about 1 degree or less in atlas laterality (~ 0.25 mm). Atlas laterality is measured in quarter-of-a-degree increments (~ 0. 06 mm). Atlas laterality of less than 0.75 degrees (~ 0. 17 mm) does not have an observed postural neurological component. Atlas rotation, spinous, and lower angle relative rotational displacements have means of approximately 2.6, 3.6, and 3.8 degrees respectively. Literature supports normal one side axial rotation between C-0 and C-1 to be between 3-8 degrees. One feature of an upper cervical subluxation is that the occipito-atlanto-axial articulations have misaligned in an abnormally coupled fashion. The occipito-atlanto-axial complex exhibits a large “neutral zone” compared with lower cervical spine segments. The blood pressure study by Bakris, Dickholtz, and Bell, raises the issue of fixation in position well within a “normal neutral zone”. Many hypothesize that a fundamental component of the vertebral subluxation complex is the development of adhesions in the zygapophysial joints after hypomobility of the structures. Paris has reportedly identified adhesions in the zygapophysial joints after hypomobility. More recently, degenerative changes have been identified in the zygapophysial joints of rats after induced hypomobility. The primary motion in the axial rotation takes place across C1-C2 unit; however, a small amount of axial rotation (~2.5 degrees) occurs at the C0-C1 unit as well. The fact that small loads produce large motions supports the notion that the ligaments across the C-1 complex are lax so the head is therefore held firmly to the neck by muscles. It can be seen that many subluxations misalign beyond this normal laxity. Determining the normal range of motion at C0/C1 is crucial for those who adjust the atlas, because it is important to know at what point a misalignment becomes a subluxation.

One study showed no difference in the magnitude of atlas laterality occurring between patients in four symptom categories: neck pain, headache, low back pain, and visceral or organic complaints. It was also found that patients with symptoms related to the cervical spine were more likely than those in the low back pain group to be associated with patients having problems that were not musculoskeletal. It has been noted that there is usually no correlation between the magnitude of the upper cervical misalignment and the severity of the patients’ symptoms. The configuration of the misalignment pattern (basic type) may be a better predictor of the degree of neurological insult. It is hypothesized that each individual has a range of misalignment tolerance before significant neurological interference occurs. For most people, this limit amount is 0.75 degrees of atlas laterality.

Intersegmental movements in response to SM can either be localized, in which case the segment contacted undergoes the greatest displacement with respect to its nearest neighbors, or regional, where several segments all move to the same extent. Chiropractic clinical theories posit that rapid intersegmental movement, especially when localized to a single motion segment, will have the greatest clinical benefit. Lee and Evans showed that the intersegmental rotations produced by slow P-A mobilizations were distributed more or less evenly across the joints throughout the lumbar spine. Triano suggested that the faster HVLA adjustment would have a more localized effect. NUCCA upper cervical practice at the Board certified level appears to be at variation with these observations. It is not a question of rapid or slow but probably more a question of the most significant area to induce change and the reduction pathway to normalizing atlas position. However, no NUCCA practitioner would deny that the timing and sequencing of motion in the reduction path way is important.

B.4. Relationship with Dentistry

Experience with neuromuscular dentistry shows an extremely important link with upper cervical misalignments. Functional relationships between diseases of the craniomandibular system and of the cervical spine are widely accepted. Craniomandibular disorder (CMD) is discussed as a predisposing factor for diseases of the cervical spine. Several studies pay attention to the anatomy, neurophysiology, and pathology of the neck and stress the existence of symptoms in the craniomandibular system which are related to disorders of the neck. It is pointed out that pain in the craniomandibular system may be caused by cervical spine disorders. However, it also appears evident that dysfunction of the cervical spine can be connected with Craniomandibular disorders, since patients suffering from neck problems report a higher percentage of CMD symptoms.

A recent study showed that there are more asymptomatic vertebral joint disorders and myofascial tender points of the neck and shoulder girdle in patients with CMD than in healthy control subjects. Craniomandibular disorders are the probable cause of these asymptomatic disorders of the cervical spine. These silent disorders have a potential role in the course of craniomandibular dysfunction. Additionally, some investigations show that the innervations of the masticatory muscles can be influenced by isolated changes in the position of the legs or by changes in the arch of the foot. Significantly more postural abnormalities in patients with CMD than in age-matched and gender-matched healthy control subjects were detected. The results suggest a close relationship between locomotor and craniomandibular systems.

Encouraged by these findings, Fink et al focused on a specific possible coupling between the craniomandibular system and the spine. One issue often discussed in clinical (dental) practice is a functional link between the craniomandibular system, the cervical spine, and the sacroiliac joint. One aim of this proposal is to test the immediate effects of a mandibular imbalance on the intervertebral mobility of the upper cervical area (with future research on mobility of the sacroiliac joint). Tilley and Hickman call attention to the importance of understanding the complex interrelationship of CMD to overall health requires a broad understanding of not only the anatomy and physiology of the head and neck but also the cervical spine and upper quarter complex. To understand neuromuscular dentistry, one is required to consider maxillo-mandibular relationships from a different perspective and its relationship with the head and neck. This is paramount for the practitioner treating head, neck and face pain, and/or dysfunction. Only recently has dentistry begun to think of the mandible and its association to the cranium as a three-dimensional relationship, rather than considering it as an isolated structure and evaluated within two dimensions as has been traditionally taught. It is understood that the mandible can move in all planes of space or in a combination of planes. These movements are relatively small and limited by many structures, but the implications are significant. Considerable accommodative or postural influences may occur within the stomatognathic neuromusculature in pathologic/dysfunctional conditions, such as malocclusion. A recent study (May 2005) showed scoliosis and a tilted atlas induced in rats as a result of inducing malocclusion. In a normal physiologic state, engrams, muscle or habitual muscle patterns develop as a result of a balanced occlusion. Malocclusion, however, alters these normal muscle patterns resulting in habitual postural changes and persistent muscle tension preventing the mandible from returning to physiologic rest. This explains much about the muscle and joint pathology commonly observed.

C. Craniocervical Ligaments

Dentate ligaments have been one important cynosure of chiropractors who specialize in upper cervical. A. Breig points out that the strongest dentates are the uppermost ligaments in the posterior fossa above the entry of the vertebral artery and that the purpose of the dentate ligaments is to attach the spinal cord to the dura and to keep it in a central position. Pathological traction can be transmitted to the spinal cord via the dentate ligaments. Breig also states that these ligaments and their attachments, on being subjected to a long period of abnormal stress, can increase in size and strength. Breig believes that since the hindbrain and the spinal cord form a continuous tissue tract and since cranial nerves 5-12 are anchored to the hindbrain that these nerves are affected by various movements of the head and neck and can trigger symptoms such as trigeminal neuralgia.

Clinical Effectiveness (Precision and Reliability)
Update on NUCCA Adjusting: Atlas Laterality and Rotation

By Professor J. Palmer, Editor, & J. Cord Palmer, Graduate student NC State

The publication of the hypertension article and recently collated retrospective data has made possible an update to the data submitted by NUCCA to the Conference for the Establishment of Guidelines for Chiropractic Quality Assurance and Standards of Practice, commonly known as the Mercy Conference, which took place in San Francisco in January of 1992. The NUCCA document submitted to the Mercy Conference was originally edited by J. Palmer.

The studies in the first table on Atlas Laterality are arranged in chronological order so that the reader can more quickly ascertain that the efficacy of the adjustment as manifested in the post-adjustment means and standard deviations has improved with time and has stabilized at a relatively high level in the last 25 years.

ATLAS LATERALITY: PRE- AND POST-ADJUSTMENT MEANS AND STANDARD DEVIATIONS

Adjuster	# Cases	Pre-Adjustment		Post-Adjustment	
		Mean	Std. Dev.	Mean	Std. Dev.
Grostic[1]	523	2.63°	1.49°	1.40°	1.60°
Gregory[2]	50	3.01°	1.81°	0.87°	1.25°
Gregory[3]	108	2.64°	1.37°	0.23°	0.51°
Gregory[4]	100	2.63°	1.39°	0.13°	0.35°
G,D,P[5]	36	2.31°	1.51°	0.23°	0.34°
Gregory[6]	50	2.69°	1.45°		
Dickholtz[7]	239	1.97°	1.24°	0.31°	0.51°
Dickholtz[8]	25	2.17°	1.41°	0.22°	0.36°

[1] Grostic (1948-1950,1963)
[2] Gregory (1958)
[3] Gregory (1982)
[4] Gregory (1989)
[5] Gregory, Denton, Palmer (1989)
[6] Gregory (1950-1983)
[7] Dickholtz (1995-1997)
[8] Dickholtz (2005)

The data in the second table indicates that the absolute difference between pre-adjustment and post-adjustment atlas laterality means from the studies in the first table not only improved with time but also stabilized at a relatively high level in the last 25 years.

Absolute differences and relative changes have nearly doubled relative to the earliest published data.

ATLAS LATERALITY: DIFFERENCE OF PRE- AND POST-ADJUSTMENT MEANS ($\Delta\ \overline{x}$); RELATIVE CHANGE OF PRE- AND POST-ADJUSTMENT MEANS ($\Delta\ \overline{x}/\overline{x}$ PRE).

Adjuster	$\Delta\ \overline{x}$	$\frac{\Delta\ \overline{x}}{\overline{x}\ \text{PRE}}$
Grostic[1]	1.23°	0.47 (47%)
Gregory[2]	2.14°	0.71 (71%)
Gregory[3]	2.41°	0.92 (92%)
Gregory[6]	2.50°	0.95 (95%)
G,D,P[5]	2.08°	0.90 (90%)
Dickholtz[7]	1.66°	0.84 (84%)
Dickholtz[8]	1.95°	0.90 (90%)

[1] Grostic (1948-1950, 1963)
[2] Gregory (1958)
[3] Gregory (1982)
[5] Gregory, Denton, Palmer (1989)
[6] Gregory (1950-1983)
[7] Dickholtz (1995-1997)
[8] Dickholtz (2005)

The 1.23 degree difference in the pre-adjustment and post-adjustment means of atlas laterality in the Grostic and DeBoer study of Grostic was used by Keating and Boline as their precision criterion. Based on this number, the data in the Sigler and Howe article and the two studies by Jackson et. al., Keating and Boline concluded that “despite high reliability findings (linear coefficients) in all three studies, the precision of measuring atlas laterality changes is still in doubt”. In essence, the relative small difference of the pre- and post-adjustment means and the relatively large size standard deviation of the post-adjustment mean allows for too much overlap in the assumed standard normal distributions of the pre- and post-adjustment populations. The Gregory (1982)(NUCCA: post-Grostic) data nearly doubles this difference. A paired T-test on Gregory data (1982; N=108) indicates that the means of the pre- and post-adjustment atlas laterality measurements to be ultra highly significant ($p<0.0001$; mean=2.412, STD DEV=1.139, SE MEAN= 0.110, T=22.01, PVALUE< 0.0001). This is an order of magnitude more significant than in the Grostic and DeBoer study. Consequently, the statistical analysis of the NUCCA data in the Atlas Laterality tables provided leaves almost no reasonable possibility that “the precision of measuring atlas laterality is still in doubt”. The more recent Dickholtz data is consistent with the earlier NUCCA data by Gregory when measured as percent reductions in Atlas Laterality.

Differences between Dickholtz pre-adjustment X-ray measurement- data and data from earlier studies is believed to be, for the most part, the result of two basic changes in procedures. One procedure affects Atlas Laterality and the other affects Atlas Rotation .

For Atlas Laterality, in those cases in which the head is tipped so much for the potential set-up for a nasium view that the right-left magnification difference becomes significant, Marshall Dickholtz Sr. “forces the head straight” on a single X-ray nasium. This first nasium is then measured for Atlas Laterality. This value of Atlas Laterality is then used with measurements from a second nasium - taken without “forcing the head straight”- in calculations associated with standard nasium listings. It is believed that this lowers the magnitude of pre-adjustment Atlas Lateralities . It should be noted that this sometimes reverses left and right Atlas Laterality on some subjects. (The Finite Element model may be capable of investigating this procedure.) Magnification factors should not be an issue on the post-adjustment data of Gregory, Denton, Palmer, or Dickholtz.

The studies in the third table on Atlas Rotation show the Grostic data and Gregory data within the same time frame. The Dickholtz data, taken from the hypertension study, is what is new. The Dickholtz data show both significantly lower pre-adjustment and post-adjustment atlas rotation means and standard deviations. This author believes that smaller pre-adjustment and post-adjustment data is accounted for by the way in which Atlas Rotation is measured on the vertex view by M. Dickholtz Sr. Dr. Dickholtz uses the whole head for the measurement of atlas rotation and not the odontoid as reference because of abnormal foremen magnums G. Patrick Foran, D.C. (Vancouver) explains it thusly: *"Dr. Dickholtz next went to work on patient placement with the chin centering device and the B.B.'s taped to the earlobes. This way he could see if the x-ray was taken in the proper neutral position. As he always checks the ear level of the patient standing against the horizontally lined wall chart before the x-ray is taken. He marks on the travel card the right ear high or low and how much. This is the position that should be obtained on the film by the B.B.'s placement on the x-ray. If the skull is tilted one half inch or more on the horizontal line chart, Dr. Dickholtz will order a "forced straight" nasium to eliminate the possibility of skull magnification distortion which would alter the central skull line and therefore the measurement of C1 laterality. This "forced straight" film is used for the determination of atlas laterality only which is transferred to the neutral film and calculated accordingly. The placement of the head clamps lower on the skull on the vertex view gave Dr. Dickholtz the consistency and confidence to use the vertical lead centre line to measure the C1 rotation rather than the foreman magnum centre which is often found to be abnormal. Of course when this procedure is used, the skull must not be rotated or tilted. Hence the use of the B.B. on the glabella to check on this variable. One by one the variables are being eliminated to ensure replication of the measurements in the analysis of the x-rays."* (Vector, Volume 5 No. 9).

ATLAS ROTATION: PRE- AND POST-ADJUSTMENT MEANS AND STANDARD DEVIATIONS

Adjuster	# Cases	Pre-Adjustment		Post-Adjustment	
		Mean	Std. Dev.	Mean	Std. Dev.
Grostic[1]	523	2.75°	1.51°	1.43°	1.60°
Gregory[4]	100	2.56°	1.57°	0.42°	0.69°
Dickholtz[8]	25	1.29°	1.05°	0.19°	0.36°

[1] Grostic (1948-1950,1963) [4] Gregory (1989) [8] Dickholtz (2005)

The fourth table on Atlas Rotation indicates the relative differences between pre- and post-adjustment means. As can be seen the Dickholtz corrections are in line with Gregory's corrections (1989) when viewed as a percentage change even though they are more similar to Grostic's when compared as an absolute change .

ATLAS ROTATION: DIFFERENCE OF PRE- AND POST-ADJUSTMENT MEANS ($\Delta \bar{x}$); RELATIVE CHANGE OF PRE- AND POST-ADJUSTMENT MEANS ($\Delta \bar{x} / \bar{x}$ PRE).

Adjuster	$\Delta \bar{x}$	$\frac{\Delta \bar{x}}{\bar{x} \text{ PRE}}$
Grostic[1]	1.32°	0.48 (48%)
Gregory[4]	2.14°	0.84 (84%)
Dickholtz[8]	1.10°	0.85 (85%)

[1] Grostic (1948-1950, 1963) [4] Gregory (1989) [8] Dickholtz (2005)

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Dental Abstract

Examination of the Relationship Between Mandibular Position and Body Posture

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Volume: 25 Issue: 4 Journal Date: October 2007

Abstract: The purpose of this study was to evaluate the effect of changing mandibular position on body posture and reciprocally, body posture on mandibular position. Forty-five (45) asymptomatic subjects (24 males and 21 females, ages 21-53 years, mean age 30.7 years) were included in this study and randomly assigned to one of two groups, based on the table of random numbers. The only difference between group I and group II was the sequence of the testing. The MatScan (Tekscan, Inc., South Boston, MA) system was used to measure the result of changes in body posture (center of foot pressure: COP) while subjects maintained the following 5 mandibular positions: 1) rest position, 2) centric occlusion, 3) clinically midlined jaw position with the labial frena aligned, 4) a placebo wax appliance, worn around the labial surfaces of the teeth and 5) right eccentric mandibular position. The T-Scan II (Tekscan, Inc., South Boston, MA) system was used to analyze occlusal force distribution in two postural positions, with and without a heel lift under the right foot. Total trajectory length of COP in centric occlusion was shorter than in the rest position ($p<0.05$). COP area in right eccentric mandibular position was larger than in centric occlusion ($p<0.05$). When subjects used a heel lift under the right foot, occlusal forces shifted to the right side compared to no heel lift ($p<0.01$). Based on these findings, it was concluded that changing mandibular position affected body posture. Conversely, changing body posture affected mandibular position.

Questions from the Students at Palmer College and Responses by UCRF Director of Research, Professor J. Palmer

Zachary Ward from Palmer College's NUCCA Club solicited responses to student oriented questions for potential inclusion in The Beacon, the College's campus newspaper. The intent was to build interest in the spring 2008 NUCCA Conference (April 10-12) in Bettendorf. The questions along with the unedited responses are given below with the intent of keeping the readership up to date. J. Palmer, Editor

1.What can you tell students who are interested in NUCCA, but are suspicious of a technique that only adjusts the upper cervical spine?

The spine is a kinetic chain, so why wouldn't articulating with any part of the spine affect all other parts. C-1 is the most movable of all vertebrae and so can have the biggest relative deviations or misalignments.C-1 is difficult to palpate. And where else in the spine are the receptors so dense! NUCCA has tremendous success with sciatica, so one can easily understand that what is done at C-1 affects the entire spine. Postural measurements of the entire body are affected by C-1 corrections to or toward normal. The hypertension study by Bakris et. al. illustrates that practice is not limited to those with pain. None of the patients had pain before, during, or after adjustment. So why would you want to limit practice to pain, palpation and range of motion when there are at least another 20,000,000 people in the US with hypertension that potentially can benefit from a different chiropractic paradigm?

2. In what ways does NUCCA research represent a challenge and/or corroboration of other forms of chiropractic?

Orthogonally -based upper cervical chiropractic may be the missing piece of the chiropractic puzzle. I think chiropractic originally deviated from the Palmers sometime in the 1940's and I hope that the orthogonally- based upper cervical system will bring chiropractic back to a unique system of health care. I think that physical therapists will have a difficult time of mastering the upper cervical correction. So why not run with it in the chiropractic colleges. Medical doctors are telling NUCCA doctors that NUCCA will not be able to take care of the demand that research is creating by what it is revealing.

3. In your opinion, what single aspect of the atlas subluxation complex is the most important for students to understand?

Some NUCCA doctors just might say if you want your head on straight then normalize the position of the atlas. I think the single aspect is that very small misalignments have a profound effect on the human system and that these misalignments do not go away with time except by chance. Again refer to the blood pressure study where the misalignments persisted with time and where the corrections persisted with time. We see normalization of blood cortisol levels and blood pressure. We see the people in the Bakris study coming off their blood pressure medication. (Of course all techniques will have their miracle cases.)

4. Can you tell us a bit about current projects that Upper Cervical Research Foundation is currently investigating and promoting?

If you visit the UCRF website you will see two studies currently listed and being promoted. There are several other studies or proposed studies that NUCCA is involved with and that other researchers are also considering or are already involved in but I would like them to be funded before they are talked about. I will update your readers when we can provide valid results.

5. What does NUCCA hope to learn from its collaboration with Dr. Vijay Goel in the finite element model of the cervical spine?

One UCRF member would say it is as simple as seeing that a bone is out of place. But more to the point, we want to see what happens as to locations of forces on a misalignment; what are the corrective forces for a given type of misalignment; how does the lateral curve affect the corrective process; can we define a normal spine and if so how; why does a misalignment pattern seem to persist over time; how are misalignments produced biomechanically; are there multiple vectors that will correct a given misalignment; etc.

6. A central NUCCA premise is that an upper cervical misalignment can be measured on an x-ray, if taken properly. Others in chiropractic disagree. For example the ASH policy on upper cervical adjusting states that, " upper cervical techniques have not been shown to be safe, effective, or scientifically plausible when they require x-rays to identify subluxation…" In what ways do you think these kinds of perspectives will change with the work of the Upper Cervical Research Foundation?

Well I would certainly like this group's take on the hypertension study. That study showed that NUCCA technique was medically judged to be both safe and effective. And my understanding is that the medical doctors who were authors had no problem with the X-rays. X-rays are not needed to identify the existence of a C-1 subluxation; posture is sufficient. However, if the chiropractor is going to do anything about it then, from the NUCCA perspective, one must know the biomechanics involved. And you cannot do this without initial X-rays on a new patient. If one does not have post-adjustment X-rays on a new patient then how does one improve as a chiropractor if the misalignment was not sufficiently corrected or if an unintended different biomechanical misalignment resulted? Is it safer to stay on hypertension medication or is it safer to have initial pre- and post-adjustment X-rays? I would not want to be on medication the rest of my life for hypertension if there was a better alternative. Would you? It is hoped that UCRF can help break the ice on upper cervical research. I know that Palmer College submitted an NIH grant application on August 13, 2007, for upper cervical research which would have NUCCA doctors involved. So UCRF, especially via Marshall Dickholtz Sr., has really started the ball rolling. The upper cervical spine is the least researched area in the spine. Just think about all the low back pain research! Research is the only answer to understanding why and how what is seen happens.

http://www.ashcompanies.com/data/pdf/resources/procedures/UpperCervicalAdjustingTechinques.pdf

7. What does the future hold for upper cervical research?

It is wide open because of the effect on just about everything when C-1 corrections are made. The next ten years will be the decade of upper cervical research whether the chiropractic colleges are involved or not. But the chiropractic colleges can really help to keep orthogonally -based upper cervical within the chiropractic profession by their own involvement in upper cervical research.

8. How do you encourage students to learn about NUCCA if they are stimulated by this unique approach to chiropractic?

Join the local NUCCA college club, intern with a NUCCA doctor, come to the NUCCA conventions, and read the old Monographs or other NUCCA literature such as the NUCCA text by Dr. Michael Thomas. I also would take a look at Orthospinology and Atlas Orthogonal if you wanted to see the rest of the family; their analysis system is very close to NUCCA's and you need to do what is best for you. After all, we are all out to help people.

Three case studies of TMD

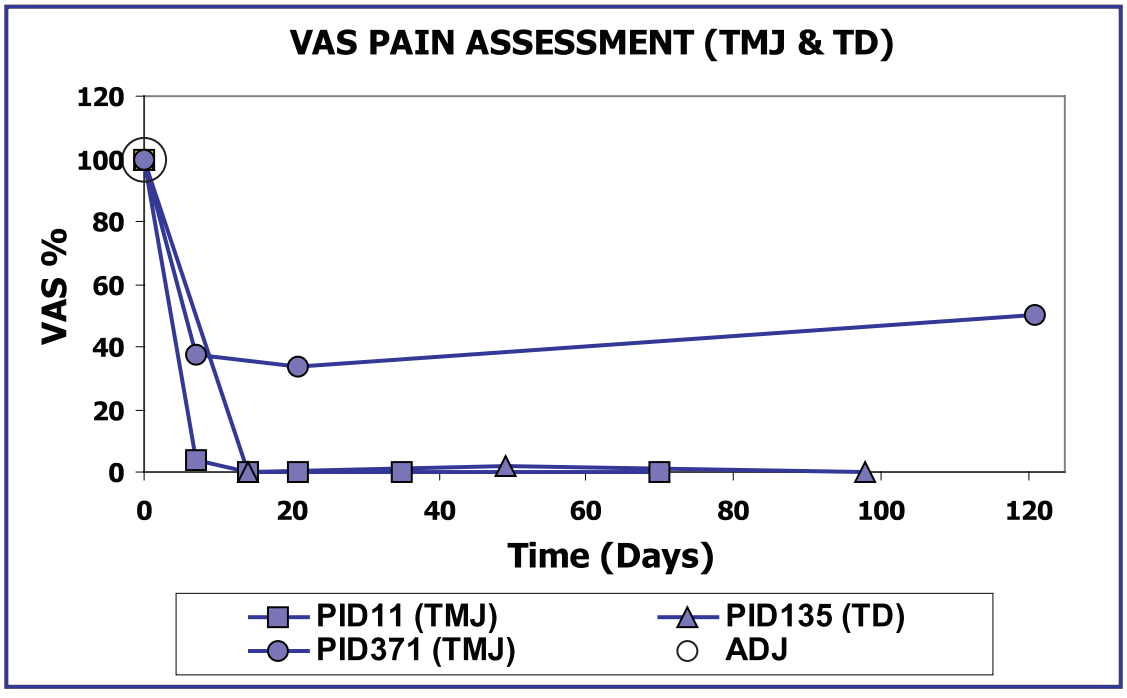
By J.F.Palmer, K. Creswell, M. Dickholtz Sr, and J.Cord Palmer

(The three case studies were taken from the power point presentation given in Kona, Hawaii, by K. Creswell of Edmonton, Canada, to the ICCMO convention in November 2005. Slides (tables) were prepared by J. Cord Palmer and script was prepared by J.F. Palmer. Marshall Dickholtz Sr. was the adjusting chiropractor.)

This study is part of a larger unpublished study done in the 1990s. The three individuals from the larger study population who were diagnosed with either TMJ (temporal mandibular joint) or Tic Douloureux (TD) are the basis of this article. Presented here is a brief patient background. The first table provides the patient identification number, sex, age, occupation, symptom, and duration of perceived TMD (temporal mandibular dysfunction) problem. It is interesting to note that if we subtract the duration of their symptom from their present age, that both TMJ patients had onset of their TMJ symptoms while in their middle teens. Unfortunately we do not have any dental history for these patients to see if the onset of TJM or TD corresponds with previous dental work.

PID	Sex	Age	Occupation	Symptom	Duration
11	F	34	Homemaker	TMJ	19 yrs
135	M	53	Retired	TD	4 wks
371	M	20	Student	TMJ	4 yrs

The following plot provides the VAS (Visual Analog Scale) for pain (range from 0-10; 0= no pain) of the same three patients, two with TMJ and one with TD, as a function of time. Only one actual NUCCA treatment was performed on each of the three patients, as indicated by the red circle on the day zero. On each office visit VAS measurements were preformed (number of data points = number of visits). (Subjects were followed for 70-121 days.) The VAS values shown here are normalized by their initial pre-treatment values. All the patients showed a significant reduction in perceived pain. Two of the three patients reported no pain within two weeks after their initial adjustment. The other TMJ patient who was a student showed a significant reduction in pain but reached a plateau at about 40-50% of his initial value.



The next table takes a look at the four physical categories in a standard, 8-category SF-36 survey form for the same three subjects. United States norms are set at 50 and a standard deviation of 10 for each of the eight categories. Pre-treatment and post-treatment results are statistically significant on the same two patients who showed the greatest improvement on the VAS instruments. However, the physical categories for PID 371 who improved on the VAS by 50-60% show no corresponding improvement on the physical categories of the SF-36.

PHYSICAL CATEGORIES	PID11 PRE	PID11 POST	PID135 PRE	PID135 POST	PID371 PRE	PID371 POST
Physical Function	57.14	57.14	40.36	50.85	55.05	50.85
Role Physical	49.17	56.24	27.95	56.24	56.24	56.24
Bodily Pain	46.05	62.75	37.48	55.9	51.61	51.61
General Health	50.89	62.59	46.21	60.25	55.57	59.32

The answer to the VAS improvement for PID 371 may be due in part to the statistically significant improvement on the 4 psychosocial categories of the SF-36 survey as can be seen in the last table. This improvement is to such a magnitude on this TMJ patient as to make the composite, 8-category, SF-36 instrument statistically significant (p-value= 0. 033). It can be seen that the other TMJ patient, PID 11, had a statistically significant regression on already low to average values in the psychosocial categories. Apparently the PID 11 patient's physical categories of wellness improvement so cancels the effects from the psychosocial categories that the SF-36 composite shows no statistically significant improvement (p= 0.543).

PSYCH-SOC CATEGORIES	PID11 PRE	PID11 POST	PID135 PRE	PID135 POST	PID371 PRE	PID371 POST
Vitality	56.15	51.42	23.02	60.89	46.69	58.52
Social Function	46.28	30.00	30.00	57.14	51.71	57.14
Role Emotional	34.27	23.74	55.34	55.34	44.81	55.34
Mental Health	39.08	32.27	61.8	59.53	39.08	57.26

Average Atlas Laterality, LLI, and pelvic tilt of the group (n=3) is 1.17 degrees, 0.92 inches, and 3.8 degrees before adjustment and 0.08 degrees, 0.0 inches, and 0.08 degrees after adjustment, respectively.

Practice Based Research - A Solution for Evidence

By H. Charles Woodfield, III, RPh, DC Associate Professor Research, Parker College of Chiropractic

"Practice-based research networks can serve as an effective mechanism to link researchers, practitioners, and patients, playing an important role in the movement to study the effectiveness of alternatives in diagnosing and treating common clinical conditions." -Alexander and Clancy (AHCPR)

Many NUCCA practitioners have experienced a patient's response to an Atlas correction that many may interpret as a miracle, unbelievable or too good to be true. Imagine a method developed for use in the doctor's practice to capture quality evidence documenting these results witnessed daily. A well designed repeatable protocol, established infrastructure and support organization allow for quality data collection. The resultant peer reviewed publication based on quality data provides the evidence to help establish validity and reliability of the standardized NUCCA procedure. This process is imperative for the organization to remain viable by providing the evidence allowing for growth.

As a direct result of the Hypertension Study(1), the public appears to be clamoring for more knowledge about NUCCA and what it can do. Few studies have created this much excitement from the public one year later. Dr. Bakris continues to receive phone inquiries for more information. The media continually requests interviews and updates from the investigators involved. The timing is ideal to provide them with evidence of efficacy and effectiveness from the NUCCA practitioners' office.

The inquisitive nature of the NUCCA practitioner continually fosters new ideas and approaches to optimize an Atlas correction. While one DC is looking at Occipital condyles, another is looking at posture or applying biomechanical principles to the work. Collection and report on each individual's study allows for the exchange of new ideas with demonstrable evidence, not anecdotes. The outcome of an effort by practitioners providing data through multi site investigation of NUCCA care is limitless. Now is the time to confirm the value of NUCCA chiropractic care with recorded evidence. It all begins by making a commitment and then taking a small step in the right direction by conducting Practice Based Research (PBR).

Practice-based research (PBR) is patient-based investigation by collecting data describing "real-life" health challenges and complaints of those routinely seen in a an office. Simply put, practicing clinicians collect data from their patients and an academic institution supplies infrastructure, training, and technical assistance. A partnership is formed between doctor and researcher to investigate topics relevant to everyday clinical practice. This empowers the input of the practitioner in investigations important to the individual and clinical research. PBR is distinct from traditional biomedical research, offering a unique perspective and vital information on practical aspects of care provided. Imagine the outcome of a well designed study protocol and resulting quality evidence collected from a multiple NUCCA doctor PBR network. Needed efficacy evidence demonstrating the benefit of NUCCA care is the beginning. Most traditional health research is conducted in university hospitals and medical centers. Similar facilities are nonexistent for the Chiropractic profession. The Research "Laboratory" is a doctor's practice that requires an administrative infrastructure to ensure valid and reliable data collection and most importantly is non-intrusive to the practice itself. The NUCCA practitioner's office provides an ideal location where conducting quality evidence based research can be easily accomplished. Beginning with a pilot study using a well defined outcome measure helps establish interactive organizational foundations by which to develop future protocols of further investigations. Established PBR Networks can receive NIH funding for diverse investigation of multiple subjects. A well established PBR Network can effectively conduct a multi site hypertension study using an improved design based on the previous work.

PBR networks have existed in family practice medicine for over twenty-five years. PBR can be designed to provide important information about NUCCA chiropractic care to other medical and non–chiropractic clinicians, the general public, policymakers and third party payers. For example, descriptive and outcome data for conditions commonly addressed by NUCCA DC's, as well as those not as common, may be retrieved through a well-designed PBR protocol. It is important to note that patient confidentiality is respected and considered vitally important to maintain data quality. Patient confidence in knowing this facilitates accurate honest answers to questions and interviews used for data capture. A number serves as the data collection identifier. Use of patient characteristics and demographics discovering who is attracted to NUCCA care provides information to develop strategies optimizing NUCCA care.

Data on diagnostic procedures such as the supine leg check, Anatometer, and radiographic examination are needed to demonstrate the validity and reliability of these measures used to locate and correct the Atlas misalignment. The NIH has a keen interest in a means to screen for Atlas misalignment in large populations. Adjunctive therapies, use of supplements and other individual unique practice characteristics allow for discovery of ways to improve patient healing and outcomes to care. Patient satisfaction, number of visits and time between visits provide important utilization patterns showing what works best for most of the people.

Patient reported outcome measures (PROM) and quality of life (QOL) measures document changes as a result of care, using pre and post treatment data collection protocols. The FDA certainly supports such use allowing these measures as an important assessment tool in new drug approval. Given the astronomical costs associated with the development and marketing of new drugs, scientifically-valid patient-reported outcome measures are acceptable as evidence for efficacy allowing approval by the Food and Drug Administration (FDA) and other government regulatory agencies worldwide. Clinical trials that meet regulatory roadblocks due to insufficient data can incur costly corrective actions. PROM data allows for use of low cost data capture for efficacy approval. This accelerated process resulted from the rapid approval of new HIV and Cancer drug treatment protocols. Demonstration of clinically significant, repeatable, consistent changes in quality of life measures using instruments like the SF-36 or SF-12 can provide much needed evidence presenting the benefits of NUCCA Chiropractic care.

PROMIS, Patient Reported Outcome Measures Information System, is part of the NIH Roadmap for Medical Research Initiative. The primary purpose is to develop a set of publicly available computerized tests for the clinical research community that appears made for PBR investigations. Creating a national resource for accurate and efficient measurement of patient-reported symptoms and other health outcomes in clinical practice provides a standard NUCCA can utilize to indicate the clinical significance of the Atlas adjustment.

A willing media audience waiting for more news coupled with newly validated patient reported outcomes have appeared at the right time. PROM can provide the foundation to begin development of a NUCCA PBR Network with academic expertise and support. It's time to take the first step.

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3. http://www.nihpromis.org, NIH roadmap of PROMIS

Dr. Woodfield began his chiropractic research career at Palmer Center for Chiropractic Research assisting in development of PBR. After introduction to Dr. Marshall Dickholtz, Sr., the quest for solving the Atlas enigma began. He was the architect of the Chronic Fatigue Case Series using the SF-36 as the primary outcome to NUCCA care. The hypertension study is based on a protocol of his design with input from the other investigators. Future plans include a Supine Leg Check validation and reliability study. Plans for a multi center practice based investigation of Atlas misalignment and the effect on blood pressure are under consideration requiring the utilization of at least 25 practitioners. Development of NUCCA PBR is the first step to realize the potential of the individual NUCCA practitioner and their upcoming role in this study.

The Basic Comparison Notes

By Professor J. Palmer

The NUCCA Paradigm: Restoration to a biomechanical and neurological normal by a manual correction.

Considerations: No palpation, no range of motion, no multiple segments to consider individually, and pain is not a basis of intervention.

Screening: By posture: Supine physiological leg length inequality (non-load bearing) and load bearing deviations using an anatometer for measurements.

Measurements:

(1) Posture screening measurements

(2) X-ray rotatory measurements including but not limited to:

Atlas laterality

Atlas rotation

Biomechanics determined by lateral, nasium, and vertex views:

Biomechanical patterns: 4 in- pattern basic types & 5 out-of-pattern basic types

Factors in setting patient for adjustment: basic type, magnitude of measurements from normal, type of headpiece, position on headpiece, mechanical skill of doctor

Adjustment: Calculated, vectored force "on" the atlas transverse process.

Force characteristics: Known direction, 1-2 mm displacement, 20-110 Newtons, pre-load, small momentum and energy(less than 0.4 Joules external on skin) and even smaller magnitude power.

Explanation: X-rays instead of palpation, position instead of range of motion, the atlas joint instead of all joints individually, posture instead of pain as the main consideration , and fewer adjustments instead of more spinal manipulation therapy.

Results: Total spine results, improvement with time of symptoms, results proportional to the degree of correction, non-corrected misalignment- patterns persist over time, improved posture, power of single adjustment.

Practice abstract

British Dental Journal 204, 187 - 189 (2008)
Published online: 23 February 2008 | doi:10.1038/bdj.2008.101

Subject Categories: Case reports | Facial pain

Vagus nerve pain referred to the craniofacial region. A case report and literature review with implications for referred cardiac pain

D. E. Myers1

Neck, tooth and jaw pain can occur with or without chest pain in angina pectoris and myocardial infarction.

The mechanism of this referred pain has not been established and is puzzling.

Stimulation of a branch of the left vagus nerve from the heart can cause tooth, neck and jaw pain.

This mechanism can help the dental provider to explain the cardiac significance of activity related jaw pain to patients.

Abstract

The pain of angina pectoris and myocardial infarction is sometimes referred to the head and neck region. The mechanism for this effect remains obscure. A case is presented here that reports that electrical stimulation of a cardiac branch of the left vagus nerve in humans can cause referred craniofacial pain. This leads to the hypothesis that the vagus nerve plays a role in mediating this pain. A review of the clinical and physiologic literature supports this hypothesis.

Top of page

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